

Buttle

Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

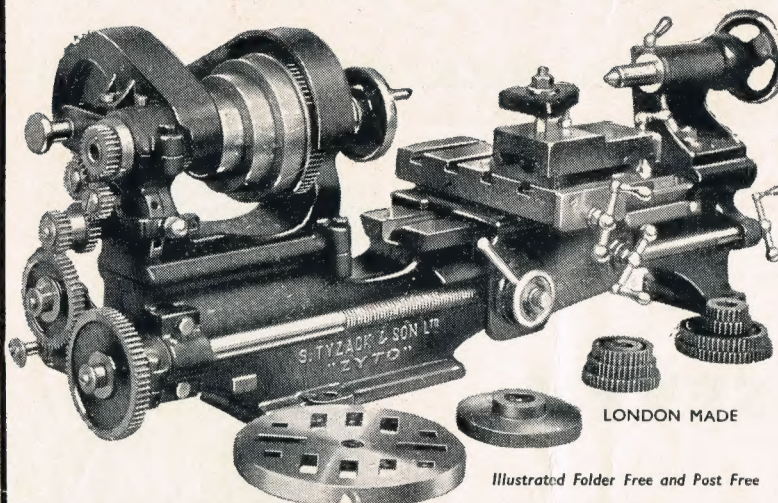
**WIN A
SUPER SEVEN**

LATHE — FREE COMPETITION

INSIDE



"Zyto" 3 $\frac{3}{8}$ " BACK GEARED, SCREWCUTTING, TURNING, SURFACING LATHE



"THE FINEST LATHE VALUE"

- ★ 12 $\frac{1}{2}$ " BETWEEN CENTRES
- ★ FULL COMPOUND SLIDE REST
- ★ HOLLOW & SET OVER TAILSTOCK
- ★ TUMBLER REVERSE
- ★ CALIBRATED SLIDES ETC.

A few unsolicited testimonials taken at random from hundreds received.

"You deserve congratulations for turning out such a fine machine."
J. T., Edmonton, LONDON.

"I consider the Zyto Lathe I have is a very nice job. Detail and finish is very good; it is a lovely machine."
N. K., Wisbech, CAMBS.

"I am pleased to report that after an extended test, the Zyto Lathe you supplied is O.K. in all respects."
D. P., Yeovil, SOMERSET.

"The Zyto 3 $\frac{3}{8}$ in. Lathe is an excellent and sturdy job. I am very pleased with it."
W. R., NEWBIGGIN-BY-SEA.

"Re my Zyto 3 $\frac{3}{8}$ in. Lathe, I must congratulate you on a very nice job."
H. B. and C.R., Belfast, N. IRELAND.

£6 12s. 0d. DEPOSIT

Balance 8 monthly payments of 74s. 4d.

Cash Price £33 0s. 0d.

* Includes Gear and Pulley Guards *

S. TYZACK & SON LTD 341-345 OLD ST., LONDON, E.C.1 Tel: **SHOREDITCH 8301 (ten lines)**

RECORD TOOLS

*The widest range to choose from for
all wood and metal working requirements*



★ The wide range of RECORD TOOLS includes Cramps, Vices, Spokeshaves, Sheet Metal Cutters, Tripod Stands, Bolt Clippers, Pipefitters Tools and more than 60 different types and sizes of Planes. Send now to Dept. M.E. for your FREE copy of our fully illustrated, 156 page Pocket Catalogue.

MANUFACTURERS:

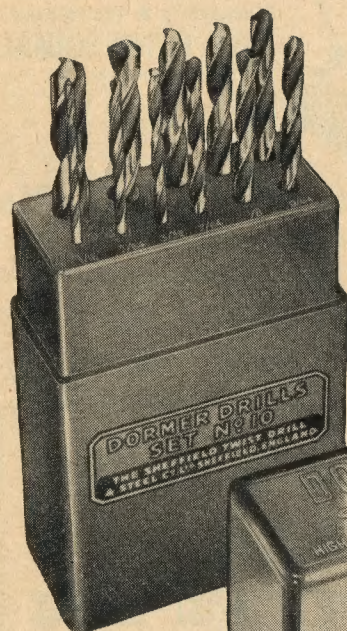
C&J HAMPTON LTD. RECORD TOOL WORKS. SHEFFIELD. ENGLAND

Keen modelmakers need

DORMER



DRILL SETS

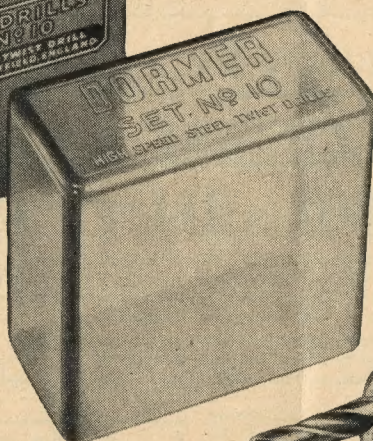


N° 9 CARBON STEEL

N° 10 HIGH SPEED STEEL

STRAIGHT SHANK DRILLS

SIZES: 1/16" TO 3/16" BY 64THS
AND 7/32", 1/4"

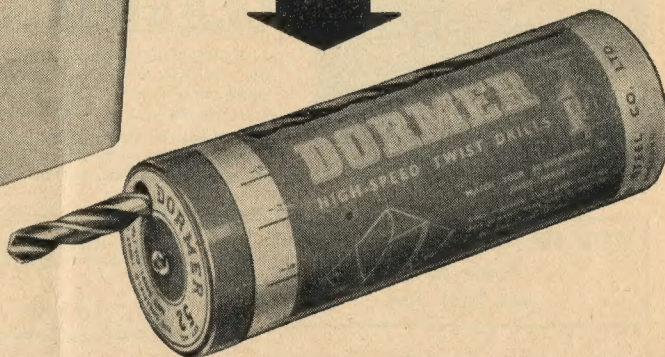
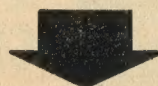


N° 52 HIGH SPEED STEEL

N° 53 CARBON STEEL

STRAIGHT SHANK DRILLS

SIZES: 1/16" TO 9/32" BY 32NDS



**OTHER POPULAR SETS
ARE ALSO AVAILABLE**

THE SHEFFIELD TWIST DRILL AND STEEL COMPANY LIMITED

SHEFFIELD

ENGLAND

DORMER DRILL SETS ARE OBTAINABLE FROM YOUR USUAL ENGINEERS' MERCHANTS

GAMAGES

ALWAYS SOMETHING NEW and INTERESTING

The Famous SELECTA "All-in-One" HOME WORKSHOP

on the EASIEST EASY TERMS

Ideal for use with most types of popular electric drills, for sawing, rip sawing, cross sawing, through sawing, sanding, grooving, mitring or routing, undercutting, grinding, polishing, drilling, etc.

£13.10 Or 9 Monthly Payments of **32'3**

Carr. and Pkg. outside 50 miles of Holborn in England and Wales 7/-, Scotland 9/3.

Suitable Electric Drills for use with the 'Selecta':—

WOLF CUB

£5/17/6 or 9 Monthly Payments of 14/3

BLACK & DECKER

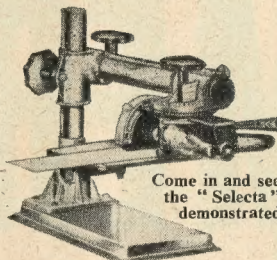
£6/19/6 or 9 Monthly Payments of 16/6

BRIDGES

£7/19/6 or 9 Monthly Payments of 19/-

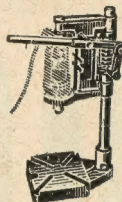
SELECTA DRILL

£13/3/0 or 9 Monthly Payments of 31/3



Come in and see the "Selecta" demonstrated

'PICADOR' VERTICAL DRILL STAND FOR ANY DRILL

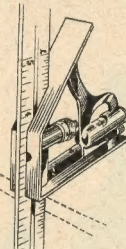


This press provides extra leverage, accuracy and control for any of the famous Electric Drills, "Tee" 66'- slotted base.

Adaptor for Wolf Cub or Bridges Tool Power drills 2/6 extra.

No adaptor is required for the Black & Decker drill. ELECTRIC DRILL EXTRA

A TOOL MUCH IN DEMAND Mechanic's & Handyman's TRY & MITRE SQUARE

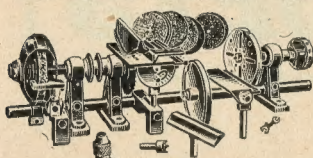


New design, lightweight head. Rust resisting finish. Double hair-line bevel gives a much wider view. Spring held scriber with hardened tip in foot of 12 in. rule which is graduated on one side by 1/8ths and 1/4ths, and on the reverse with 1/8ths and 1/32nds.

Post & Pkg. 1/-.

8'6

'PICADOR' Home Handyman UNIVERSAL LATHE



PARTS CAN BE PURCHASED SEPARATELY

Can be powered by any "Wolf Cub," "Black & Decker," "Handy Utility" or "Bridges" Tool Power 1/2 in. capacity Electric Drill. Robustly constructed For Turning, Sawing, Sanding, Drilling, Grinding, etc.

£6.15

Or 9 Monthly Payments of 16/- Carr. & Pkg. 5/6



SHOWING METHOD OF ASSEMBLY DRILL TO PUP

Fitted with Porous and Graphite impregnated Bronze Bushes. Weight 12 lb. Carton size 25 x 6 1/2 x 6 1/2 in. deep with 24 in. tube bed.

New Electric Drill Cradle with flexible drive as shown 23/- 36 in. Lathe Bed to accommodate cradle 2/6. A special adaptor for Bridges Drill 2/-, drills extra.

GAMAGES, HOLBORN, LONDON, E.C.1

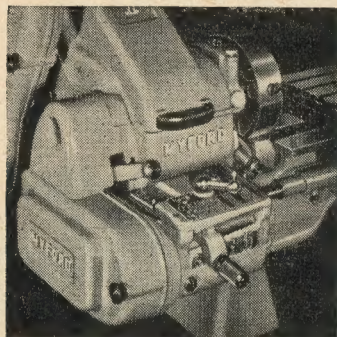
HOL 8484

Tool & Motor Car Accessories List

FREE

Send now for your copy of this useful and popular catalogue.

Open Thursdays until 7 p.m.



THE MYFORD RELEASE OF THE YEAR

QUICK-CHANGE (48 Threads & Feeds) GEARBOX for ALL "ML7" & "S7" LATHES

The MYFORD Quick-Change Gearbox is designed for smooth, easy operation and long life. The high tensile steel box-gears are mounted on precision ground high tensile steel shafts and revolve in a bath of oil. The Quadrant Gear Pins are of extra large diameter and provided with oil nipples for pressure lubrication.

The Chart on the Gearbox lid shows lever and gear positions which cover the normal range of pitches up to .125 in. and feeds down to .002 in. The slotted Quadrant permits the use of changewheels and enables the cutting of Metric, B.A., and hundreds of odd pitches.

OUR 1957 BUYER'S GUIDE

Ready April
post 1/6d. free

Quick-Change Gearbox Attachment complete with Hinged Guard, Installation and operating Instructions. (Please quote Lathe Serial Number).

£23 : 13 : 0

CARRIAGE PAID (Mainland only)

EARLY DELIVERY

We can now offer early delivery of your "ML7" or "S7" Gearbox—Hire Purchase with pleasure

EXTRA EQUIPMENT:—SLOTTED QUADRANT for odd pitches, £1 1s. 6d. METRIC CONVERSION SET comprising Slotted Quadrant 10 Changewheels, 2 Spacers and Studs, £5 7s. 6d. QUICK CHANGE LEADSCREW if required—installation instructions cover shortening existing leadscrew—"ML7" 42s. (Nut 10s.), "S7" 62s. (Nut 26s. 6d.).

T. GARNER & SON LTD — Your MYFORD Specialists
6-8, Primrose Hill, **BARNSELY** Open All Day
'Phone 2908 Saturdays

Model Engineer

28 FEBRUARY 1957

VOLUME 116

No 2910

Subscription 58s. 6d. (U.S.A. and Canada \$8.50) post free

Published every Thursday

Incorporating SHIPS AND SHIP MODELS

IN THIS ISSUE

- 299 Smoke Rings
- 301 King's Canterbury
- 304 M.E. musical clock
- 307 Beginner's workshop
- 308 U.S.S. Constitution—4
- 312 Carburettors—I
- 315 The Boat Show
- 316 Sydney S.M.E.
- 318 L.B.S.C.
- 321 Light milling spindle
- 325 Expert's workshop
- 327 Readers' queries
- 328 Postbag
- 332 Club news
- 333 Win a Myford lathe

NEXT WEEK

- Building a model cruiser: using materials to hand
- A model Jacobs type chuck: exercise in craftsmanship
- M.E. Clubs and rates: Section 8 of the Act explained
- Ship modelling hints
- Ship modelling for beginners
- A grinding machine: a piece of equipment which has several novel features

All correspondence should be addressed to the Editor, Model Engineer, 19-20 Noel Street, London. W.1.



A WEEKLY COMMENTARY BY VULCAN

IN the past fortnight I have been using high-impact glues on wood and have been most impressed with them.

Most readers have probably had some experience of the adhesives but for those who have not, the technique is simple but positive (sometimes alarmingly so). The glue is spread thinly on the two faces of the work, allowed to dry for 15 minutes and then the two parts are pressed together.

The joint is immediate and unbreakable and the only snag I have encountered is that you only have one try. There can be no fiddling about if the parts are slightly out of line, but this factor does encourage careful marking-out!

I understand that high-impact glues can be used in metalwork and I am hoping to try out a few experiments on these lines.

The America Cup

FOR years the fact that America still holds this famous £100 yacht trophy has worried a certain section of the yachting fraternity. For over a century we have been trying vainly to win it back, the last attempt being in 1936.

Since then rising costs and diminishing fortunes have put an end to the spacious days of yachting, when the King sailed *Britannia* and such magnificent yachts as *Valkyrie*, *Astra*, *Thistle* and *Meteor* were the play-

things of the aristocracy. Later, business magnates Lipton and Sopwith produced their *Shamrocks* and *Endeavours*.

Last year the New York Supreme Court revised the rules, reducing the waterline length from 65 ft to 44 ft, and permitting the challenging yacht to be transported across the Atlantic instead of having to sail across.

Renewed interest

As a consequence interest on this side has revived, and there is a movement on foot to reopen the contest. A new yacht is proposed, to be ready to race in 1958. It will presumably be of more-or-less orthodox design, as it must conform to the rules, but a number of recent improvements can be incorporated. The rules, of course, apply equally to each side.

The cost of the new yacht may be about £30,000, but this is much less than the cost of the larger type of yacht raced under the old rules and a number of influential people are definitely interested.

K. and E.S.R. book

ERNEST F. CARTER'S article on the Kent and East Sussex Railway [December 20] has prompted Mr M. Lawson Finch to send me a copy of his book *The Rother Valley Line* which is a complete history of the

SMOKE RINGS . . .

K. and E.S.R. from its opening in 1900.

Published by the author, the book is very well printed and profusely illustrated with pictures of the historic locomotives and rolling stock which operated this line. It has a selection of maps, timetables and diagrammatic layouts associated with the railway and there are also illustrations of some of the tickets issued to passengers.

Though the publication is a paperback edition the text is printed on robust paper and is obviously made to withstand the dogeering it can expect at the hands of enthusiasts.

I feel quite happy in recommending this book, price 7s. 6d., to those who are fascinated by the Garden of England line.

Thank Maudslay

I WONDER how many of us reflect on the origin of the equipment we use in our workshops? The humble screw, for instance, has a fascinating history.

Screws at one time were made by hand. Every bolt had its own individual thread, differing slightly from its fellow. It had its own nut, and the two were companions for life. Change one and you had to change both,

A stained-glass window in St. James' Church, Paddington, which portrays a Great Western engine heading a train out of the London terminus



for screws and nuts were not interchangeable.

Think for a moment of the chaos if that applied today, with every screw a different gauge. It doesn't apply, and for that we must thank a Maudslay—the great Henry Maudslay whose slide-rest made the screwcutting lathe and standard threads possible.

Search for accuracy

Tribute to him is paid in a little booklet on the history of the Maudslay Motor Company

His constant aim was greater accuracy, but really close tolerances were impossible with the rough measuring instruments of the day. Maudslay found the answer. He invented the micrometer—and it was correct to 0.001 of an inch.

His nickname for it was the "Lord Chancellor," and the original model can be seen today—with other Maudslay inventions—in the Science Museum in South Kensington.

Branch lines

IN some respects the House of Percival Marshall, which publishes this journal, is like the railways it frequently writes about; it serves and develops many areas that are not reached by the main line.

I was reminded of this facet of our existence by a letter from Mr R. A. Mills, secretary of the Manchester Model Railway Society, for it was through the launching of our shed companion, *Model Railway News*, that the M.M.R.S. was born—and the *Model Railway News* came into being through *MODEL ENGINEER*!

Sometimes, unfortunately, like full-scale railway operation, a branch line has to be closed, as happened recently with *Ships and Ship Models*, which from January has been integrated into *MODEL ENGINEER*, but I am glad to say that *Model Railway News* is steaming very well.

By the way, the Manchester Society is holding its 32nd birthday party on March 9 when Mr G. Dow will speak about the Midland Railway at the College of Adult Education, Lower Moseley Street at 2.30 p.m. The annual dinner will be held the same day at the Carlton Restaurant at 6 p.m.

Needed—working exhibits

PLANS for this year's Model Engineer Exhibition are well under way. As announced recently, it will be held at the New Horticultural Hall from Wednesday, August 21, to Saturday, August 31 (Sunday excepted).

Cover picture

A Myford Super 7 lathe is the prize of a free competition organised by MODEL ENGINEER. Turn to page 333 for the details and form, the completion of which might well bring this magnificent piece of equipment to your home workshop. The picture was taken with the co-operation of Buck and Ryan, 310-312, Euston Road, London, N.W.1.

This will be the second exhibition to be organised by Mr J. A. Kreps. He is finding the going a lot easier this year with the knowledge which he gained last year and against the background of a most successful event in 1956.

He was telling me the other day of the plans as they stand at the moment. They sound attractive, but he is still on the look out for displays which can be included.

The type which he is most anxious to track down, of course, are those which move or which can be animated. It is not easy to find new displays each year which accord with model engineering practice and which have not already been seen at many other exhibitions.

I have promised to keep my ear to the ground for likely ideas and I shall welcome any help in that direction from readers.

"Cutty Sark's" casks

SHIPS enthusiasts who have modelled detailed scaled replicas of the famous *Cutty Sark* will now have to add a minor refinement.

H.M. Coastguard have presented to the "Cutty Sark" Society two harness casks which are to be placed in their authentic positions either side of the poop.

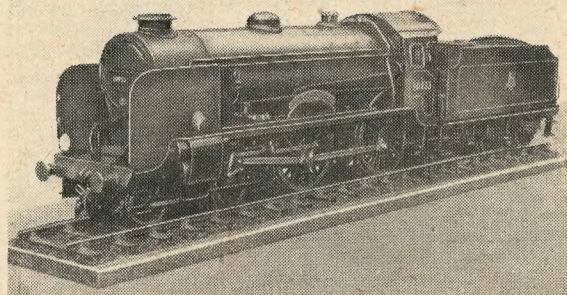
The casks, slightly conical in shape, made of oak and brass bound, were made at the Royal Victoria Victualling Yard at Deptford from specifications drawn up by Mr R. Bennett, a Master Cooper with a lifetime Admiralty experience.

Harness casks were used to store such provisions as salt beef submerged in a solution of brine of such salinity that "a freshly peeled potato would float on it."

Cutty Sark, now refitting at Greenwich, will be formally opened to the public by the Queen and the Duke of Edinburgh on June 25.

KING'S CANTERBURY

F. TUCKER'S 3½ in. gauge Schools class locomotive has proved itself, after sundry setbacks

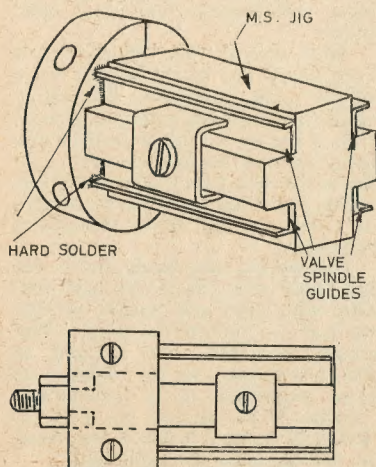


I STARTED *King's Canterbury* some 20 years ago, in thought, at least. At about that time, a friend gave me some copies of *MODEL ENGINEER* and the seed was sown. An Adept lathe was purchased and an attempt made to "design" a locomotive, but this period, which included an effort at building L.B.S.C.'s *Small Bass*, is not the subject of this article.

After a period in the forces, some of the "hard earned" gratuity was sunk in obtaining a new ex-M.O.S. lathe and, much better equipped and with more experience, my first love *Small Bass* was resurrected and this time completed successfully.

Nothing succeeds like success, so I decided to have a go at a coal-fired locomotive, with lots of encouragement from my small son. Being a Southern fan, and with L.B.S.C.'s *Roedean* notes just finished, coupled with the fact that I could see the prototype at Charing Cross during my lunch hour, the Schools class seemed a natural choice.

Fig. 1: The jig for silver soldering the valve-spindle guides



The frames presented no difficulties and were duly produced, the wheels were machined, and here I was thankful for the power cross-feed which allowed me to do something else during the long facing cuts. The cleaning-up of the spokes was done in appropriate surroundings.

At the time I was catching an early train for the 33-mile journey to town and travelled with the same friends each day, it seemed a pity to waste all this time. A couple of Swiss files and a wheel travelled with me each day and cleaning-up proceeded at the rate of about one spoke per day.

The first snag came with the crankshaft, due to an over-enthusiastic application of hard solder when brazing up. A blob and a large fillet appeared on the bearing surface of the crankpin. This meant making up a split clamp to mount the main journals off-centre and erecting a set-up on the faceplate to remove the offending metal with a suitably ground parting tool blade. The wheels were then correctly set and pressed home; also the bogie was completed.

The cylinders were tackled next, not without some misgivings which it turned out were fully justified. Two castings were machined all right, but the third showed some nasty blow-holes in the bore and was exchanged. The replaced casting was quite sound.

An error in the drawings nearly gave me some piston-valve liners with ports outside the main casting! But this was spotted and no harm was done.

The real fun came when the liners were fitted. The first one went in nicely but the second was very tight and, as I feared, after it was finally pressed home a test showed that it had telescoped and the ports at one end were no longer to size.

I decided not to risk it with the third, so this one was slightly reduced in diameter, tinned and sweated in. The faulty liner was carefully measured and a gauge made to show the correct location of the ports. A special cutter ⅜ in. dia., of Woodruff pattern, was

used to bring the port to size, the cylinder being mounted on the vertical slide.

This was not the end of my troubles, however. When the reamer was put through this liner the bore did not clean up, due to distortion, and a further check with a plug gauge showed that the main bore was no longer true. Both bores were machined again, this time with a boring bar between centres.

The cylinders were finished with dural pistons and stainless steel bobbins. The valve gear and coupling rods were fluted with home-made cutters. Considerable thought was given to the valve spindle guides. These were built up and comprised seven separate parts which were silver soldered together on a special jig as shown in Fig. 1. The chassis was completed without further mishap.

The boiler was the next item on the programme. The only receptacle which would accommodate the wrapper sheet for annealing was the dustbin, so this was borrowed for the occasion by kind permission of the powers that be.

The annealed sheet was beaten round a former turned from an old railway sleeper. The remainder of the construction followed the "words and music" but after brazing up the air test showed a bad leak at the point where one superheater flue entered the firebox.

The correcting of this fault gave me considerable trouble. Several attempts with the five-pint and Easy-flo were unsuccessful, no doubt due to the unequal expansion, and being a lone hand I appealed to the experts at Noel Street. Once again they saved the day and the problem was solved by heating the *whole* of the boiler to just red heat, then the silver solder was run in and the whole covered up to cool off slowly.

After pickling, the stays were put in and although some pinholes showed up during the air test, the pressure test was perfect. The boiler was covered with 0.015 in. brass sheet, but no asbestos lagging was used as

the dimensions did not allow for this.

The smokebox was made and erected. To conform to the prototype, the snifters were re-positioned at the front of the smokebox and made open to the air through the bottom, dummy patches being fitted to give the right appearance.

The Bulleid chimney which I like very much, to the disgust of some of my friends, was photographed and estimated measurements taken. This involved climbing halfway up a platform lamp standard, but I found the results were pretty good when I was able to compare my drawing with an official outline. It is built up from four pieces, but I'm afraid it does not quite have the appearance of being made of sheet metal. It is, however, attached to the smokebox by the correct number of hexagon bolts, i.e. 12.

Boiler fittings generally conform to the "words and music," with the exception of the brake valve which has been made to look like the full-size job.

At about this time the Farnborough S.M.E. was formed and on joining I found a number of enthusiastic friends. Three of these joined me for the first steam raising. In order to test its hauling power, a portion of track, composed of bed-frame angles, was laid, the locomotive running on the flat, not the edge of the angle, later a truck was made, real Heath Robinson, with the flanges on the outside, $6\frac{1}{2}$ in. gauge.

This was not ready at the time of the steam trial, so an old pram chassis was pressed into service. The boiler was filled and with 30 lb. of air pumped in it showed no leaks, so the extension chimney was put on and the vacuum cleaner coupled up to provide draught. The fire was lit with everybody excited and if they were all like me, rather apprehensive.

A little pressure showed on the gauge after seven minutes and the blower was then put on and the extension chimney removed. As the pressure rose, a leak appeared at the lower gauge-glass gland-nut, but a little tightening up cured it and the safety-valves were adjusted to the correct pressure. The water level had to be maintained by means of the hand pump, which was coupled on as required.

We carried her out to the track, which was laid at ground level on the garden path. We had a bit of excitement here. I accidentally knocked the regulator open and the friend at the smokebox end was treated to a minor eruption from the chimney. Fortunately he held on or there might have been no test that day.

Once on the track, the pram was hitched on and the great moment had

arrived. After warming through, the regulator was opened and with two children as passengers she moved off with myself running alongside to operate the regulator.

We hauled her back to the start—the coupling, a piece of copper wire, would not allow running in backward gear—and many more trips were made finishing with myself balanced rather precariously, on the truck. Very satisfied, we retired for a cup of the engineman's best friend.

The need for putting water into the boiler at the right moment made the injector the next essential. This was made with home-made reamers and to my amazement, it worked first time.

The running boards and cab were added next and the rain strip and angle round the front of the cab were bent and formed from soft copper sheet. A temporary tender on dural wheels was knocked up out of a wooden box with a tin inside for water supply. This was needed as we wanted to try her on a continuous track at a club exhibition which was in the offing and I proposed to operate a passenger track.

At this exhibition we were in steam all day apart from meals and a breakdown. Several times during the afternoon starting was difficult and eventually she would not move at all. We found that the wheels would not make a complete revolution and the

fault was traced to the centre cylinder where there appeared to be an obstruction at the front end.

The engine was taken to my workshop and after dismantling the lubricator, the front cover was removed and we found that the piston had worked loose on its thread. The piston and rod were removed and the piston pinned to the rod, then it was re-assembled and hurried back to the exhibition and steamed up in less than 90 minutes. A test of hauling power showed that we could pull about 45 stone.

Soon after this we moved house and there was a slight pause until the workshop became operational again. During this period I contacted and joined the Harrow and Wembley S.M.E. and after seeing some of the locomotives in the club I decided to try and work in as much detail as possible. With this end in view, the tender coal space was modified to conform with the prototype and the brake column re-positioned.

Including detail

The tender chassis was made. Suitable hornblocks were not available so the nearest I could get were "carved" a bit to suit. Working leaf springs were fitted to the boxes, each spring having 30 leaves. While selecting the hornblocks I was surprised to be offered castings $1\frac{1}{8}$ in. long, whereas the drawing showed 1 in.

Correspondence did not reveal the answer, but later when offering up the frames and wheels to the engine and checking the buffer beam levels the reason became obvious; the tender was $\frac{1}{8}$ in. lower than the locomotive. This was overcome by lowering the centre of the axle in the axlebox and running them $\frac{1}{8}$ in. lower in the horn slots.

The total effect is not noticeable. The tender body is entirely of brass sheet and contains the usual hand pump.

After several runs difficulty was experienced due to the suction valve of the pump sticking on its seating while the tender was standing between trips to the track. This led to the pump being removed to free the valve. On the advice of a friend, when re-fitting, a plug was fitted in the tender bottom to enable the ball to be prodded if necessary.

This worked very nicely, but it was invariably after the tender had been filled with water and coupled up that we had to remove the plug. Wet elbows were the usual outcome of this manoeuvre, so the fitting was later modified to a permanent "pusher" as shown in Fig. 2. Strangely enough, it hasn't been used in running since the exhibition.

Fig. 3: A Modification to the tender buffer

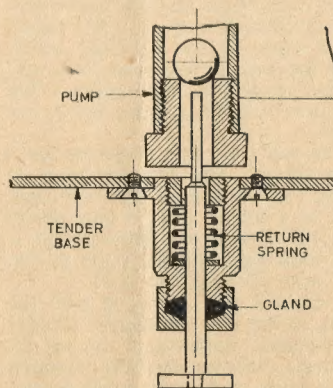
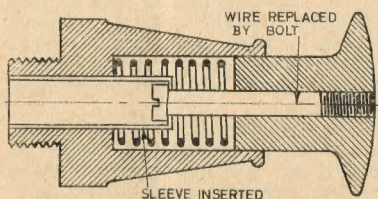
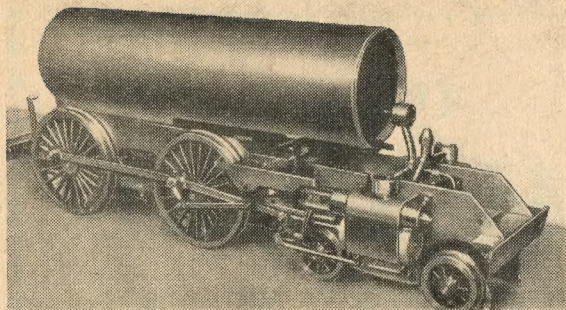
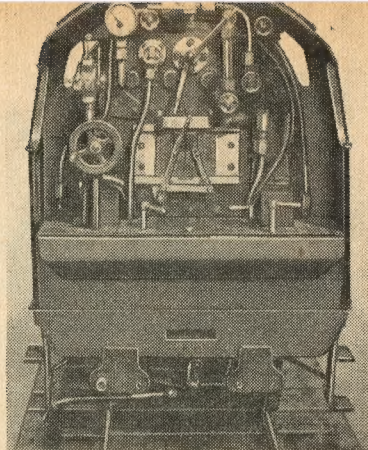


Fig. 2: Modification to prevent suction valve sticking on seating



Left: The chassis and boiler under construction



Right: View of the well equipped cab

The tender was completed in time for the opening of the track season, so we were out on all the track days. The blast, when working hard on the gradients, proved too heavy and pulled holes in the fire, so the blast cap was opened out to 7/32 in.; this was no doubt possible in part because a rather bad blow had developed which assisted the blast.

We found she had the prototype's tendency to slip, so weight was added at the rear by filling two pockets at the rear of the running boards beneath the footplate with lead; this gave a marked improvement.

We had a very good season and had the satisfaction of winning the club slow running competition by taking 23 minutes to cover 700 ft non-stop! During this time, two failures of the tender buffers occurred due to the flexible cables breaking. The assembly was modified and they have given no further trouble.

At this stage much of the detail was added, and the stove-type door was replaced by a sliding type in stainless steel. Many of the details required the simulation of hexagon bolts, but no stock screws had the required size heads—in some cases screws would have been more difficult to fit than rivets.

Making hexagon rivets

To provide the required stock to produce the hexagon head rivets, a draw plate was filed up from $\frac{1}{2}$ in. gauge plate having three holes, hexagonal in shape, so that nickel silver rod could be cut down to the smallest size in three passes.

I say "cut," because the metal was removed in curly shavings, a little soluble helping the process. About 6 in. lengths were produced at a time.

The method used was to grip the rod in the three-jaw chuck with about $\frac{1}{8}$ in. projecting—tapered to provide a start. The plate was then forced over the stock by means of the tailstock, the stock being advanced a little at a time. After one pass, the rod, now hexagonal, was passed through the next smaller hole, and so on to the smallest hole. Some 150 rivets were produced from the stock.

At about this time the nameplates were started. I wanted to make them myself and didn't want to desert my prototype for a shorter named one, so it was obviously going to be a long job. Photographs were taken and enlarged to scale size to obtain the correct proportions. The back-plates were fabricated and the letters cut from brass sheet and sweated to them. Much of the shaping of the letters was done in the armchair by the fireside, spread over a period of about four months, the total time being about 50 hours.

Livery problems

The tender lockers are made detachable for ease of firing on the track. The left-hand locker hides the injector water valve when in place. The appropriate oil feeder, paraffin can and lamps were produced as near scale as possible after checking up on the full-size article.

It took a long time to decide which livery to follow when painting. The fact that I could not get a green which I could rely on to keep its colour on the unlagged boiler, and suitable black stoving enamels being to hand, made the final decision in favour of the black, although I would have preferred the green finish.

An ex-W.D. Heywood compressor was fitted up with air-vessel and gauge and a spray-gun borrowed for each of the many spraying sessions. A stoving oven about 26 in. $\times$ 8 in. $\times$ 8 in. was made from an old ammunition box with one end cut out and suspended over a gas ring.

The nearest gas point was in the house, and no hose was available, so all the pieces of tube I could find were strung together to carry the gas to the workshop. The locomotive was completely stripped and checked for wear. The reason for the blow was soon found. For some inexplicable reason, one of the piston-valve bobbins was obviously not stainless steel and was badly corroded, also the pistons had been attacked.

All the bores were trued up with a lap and new pistons and bobbins fitted, this time made from chilled

bronze. The main bushes were renewed, but the valve gear was perfect which speaks well for case-hardened rods and pins.

The frames, running boards and cab I was able to have bonderised, which avoided some difficult cleaning. The remaining parts were cleaned in several baths of petrol. After partial re-assembling spraying was started, but owing to the fact that the large items occupied almost the whole of the oven, many week-end sessions were needed to get this part of the job done.

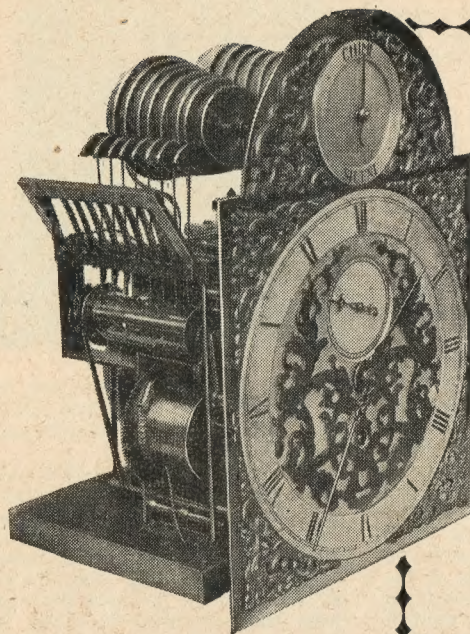
The brass parts were treated with self-etching primer and most of the parts had three coats of stoving enamel. The proportions of the lining were taken from the B.R. leaflet and an unsuccessful attempt was made to line the boiler bands and cylinder lagging by masking and spraying, but experiment showed that the best results were obtained by using a ruling pen and Valspar enamel straight out of the tin.

Templates were made for the cab side and splasher lining. When assembly had progressed far enough, a successful air test was made and then the cab was added. The B.R. totem was a problem, but after producing a photograph the correct size I tried my hand at what I thought was the most difficult part, the lettering.

Having satisfied myself that I could produce tolerable results, the outline was transferred to the tender side and the design filled in one colour at a time. The finishing touches were not put on until the eve of delivery to the exhibition hall. A few runs have been made since the exhibition which prove she has benefited from the overhaul.

I should like to acknowledge the valuable assistance rendered by the C.M.E.'s office, S.R. British Railways, in dealing with my many queries; the help received from the footplate men themselves, and the encouragement and advice of my fellow members of the H. and W. S.M.E.

Now for the next locomotive. ■



The M.E. MUSICAL CLOCK-12

By C. B. Reeve

This instalment on the plotting of the chimes concludes the series of articles describing the construction of this handsome timepiece

Continued from 14 February 1957, pages 250-253

THERE REMAINS the pinning of the chime and musical barrel which will now be described. The chiming barrel should be first taken in hand. Trim up a piece of fine note paper to fit the length of the barrel and to fit round the circumference of the barrel, so that the edges of the paper just butt together.

Lay the paper flat and divide the paper into 60 equal parts where it went round the barrel, counting as one division where the edges of the paper met. These lines must be very carefully and evenly set out. Return the paper to the barrel again. (It can be fastened temporarily to the barrel with two rubber bands.)

See that the barrel is pumped by the spring on the cock to the right; that is to say, the shoulder of the front pivot should be in contact with the front movement plate. Mark on the paper the centre of each of the eight hammer tails. The paper is now removed from the barrel and lines are drawn from end to end of the paper which will now show the positions of the hammer tails.

Carefully flatten the paper, and we are ready to plot out the positions for the pins. There will be required five separate peals of eight notes each to be pinned on the barrel, plus five equal rest spaces. Five peals of eight notes to each peal equal 40, and five rest spaces of four note units each

equal 20, which added to 40 gives 60 divisions, which have just been made.

The highest note in the peal is called No 1, and is struck on the smallest bell, and the lowest note is called No 8, and is struck on the largest bell. No 1 bell and No 1 hammer are situated at the right-hand end of the barrel next to the front movement plate.

Fig. 40 is a sketch of the chart for placing round the barrel. The order of the notes in each peal is as follows, starting from the right-hand end of the barrel:

Canterbury Chimes

- 1.—8 7 6 5 4 3 2 1
- 2.—8 6 4 2 7 5 3 1
- 3.—8 7 6 5 1 2 3 4
- 4.—8 2 7 5 6 3 4 1
- 5.—8 1 2 7 3 5 6 4

At the first quarter No 1 peal is chimed; at the second quarter Nos 2 and 3 peals are chimed; at the third quarter Nos 4 and 5 peals, followed by No 1 peal; at the hour Nos 2, 3, 4 and 5 peals are chimed. Thus it will be seen that the chime barrel makes two rotations per hour.

The St Michael's Chimes

- 1.—8 7 6 5 4 3 2 1
- 2.—8 3 4 2 5 6 7 1
- 3.—8 1 2 7 3 6 5 4
- 4.—8 3 4 7 5 6 1 2
- 5.—8 3 7 5 1 6 2 4

To obtain the position of the pins in the barrel for the St Michael's chimes, with the paper still on the barrel, the change chime lever is now used to pump the barrel arbor towards the back movement plate, and the centres of the eight hammer tails are again marked on the paper.

Referring to Fig. 40 again, it should be noted that the Canterbury chimes have been plotted with solid black dots, and those of St Michael's with open ring dots. After the pinning of the chime tunes has been done, the paper is returned to the barrel and carefully stuck to it with Bostik cement. An adhesive of a gluey nature is not suitable.

With a miniature centre punch centre pop each dot. Accuracy is the secret of success with this operation. When all dots have been centre popped, strip off the paper chart and drill the holes for the pins. The diameter of the pins is about 0.025 in., and domestic pins known as quills are excellent for the purpose.

The pins must be a tight fit in the holes and a test should be made before drilling the barrel. Each hole can be slightly tapered with a broach if desired. After drilling all holes, insert the pins one at a time and gently tap into position. Now shorten the pins considerably, but leave enough for driving them home. During the hammering process, the barrel must be held in the hand.

Reduce the height of the pins of the

first peal to roughly their correct length and return the chime barrel to the movement frame and try the action of the pins with the hammers. When the last pin of No 1 peal has lifted and disposed of, No 8 hammer, the next on-coming pin of No 2 peal, should be clear (in this case) of No 1 hammer. The pins in No 1 peal must be shortened until this is obtained.

Strictly speaking, after a completion of a peal with the gathering pallet locked by the rack pin, the tails of the hammers should be midway in one of the rest positions of the chime barrel. But if this is carried out, the pins in the barrel may give a rather poor lift to the hammer tails with a consequent loss of sound from the bells.

When the length of the pins has been decided, a small jig should be made from a scrap of silver steel.

File the thickness of the silver steel to match the height of the pins, followed by drilling a small hole through the steel and then harden the jig. All that it is necessary to do is to slip the jig over each pin in turn, then cut the pins to final length, leaving just a trifle for filing down with the jig in position.

Finally, the ends of the pins should be rounded off with a simple tool made for the purpose. Take a piece of, say, $\frac{3}{16}$ in. dia. silver steel, face one end off true, then file a V-notch diametrically across the end, followed by another V-notch filed at right angles to the first notch. Harden the steel and leave it dead hard.

To use the tool, place it over the end of pin and twirl it round a few times. This will have the effect of rounding the end of the pin and burnishing it at the same time. Before

inserting any pins in the barrel the latter should be well polished. This will be the last opportunity as it cannot be done after the pins have been inserted.

PINNING THE MUSICAL BARREL

This is carried out on very similar lines to the chime barrel. The distance round the circumference of the barrel and the length of the barrel should be obtained the same way with a piece of thin note paper. Before choosing the tunes, the following points should be considered.

If two notes of the same pitch follow one another it is preferable to have two hammers to each bell; otherwise the on-coming pin may pick up the hammer tail before it has been discharged by the first pin. It is better to have a tune in which the same notes do not immediately follow each other. An examination of the chart of the tunes of the chimes will explain what is meant.

With a set of 10 bells there is quite a choice of tunes, but this range will not cover all tunes. Assuming the four tunes have been chosen, select the longest tune and count up the number of notes it contains, counting a crotchet as one note unit, a semibreve as two note units, and a breve as four note units.

Supposing the number of note units amounts to 200, it will be necessary to divide the circumference of the barrel into this number of units, but a few extra will be required for the rest period on the finish of the tune. Ten units would be enough, so the barrel circumference would then be divided into 210 divisions. It does not signify if the other three tunes are of shorter duration.

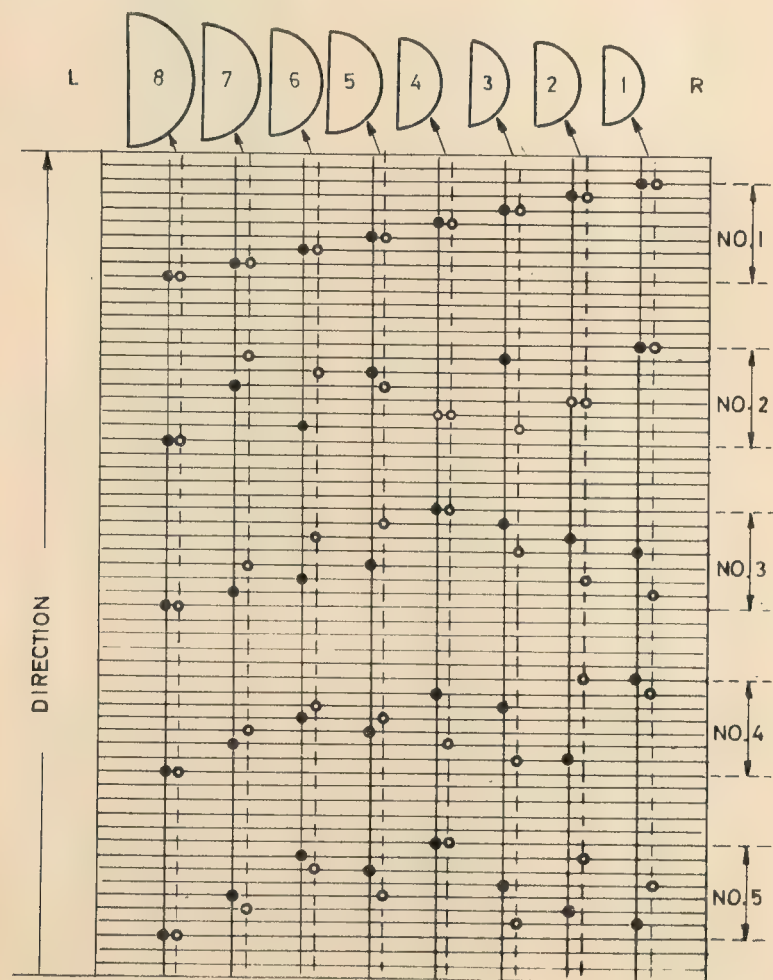
Getting divisions accurate

To get the divisions accurate, I joined up several pages of ruled writing paper and then reduced it by photography so that the required number of lines or divisions would go round the barrel. The photographic print was carefully stuck to the barrel and the centres of the 10 hammer tails were marked with the barrel arbor pumped to the front movement plate.

The change tune lever was moved to the next step, pumping the arbor towards the back movement plate, and again the hammer tail centres were marked on the print. Thus all four hammer positions were marked out this way.

The print was detached from the barrel and lines were drawn indicating the hammer positions for each tune. If different coloured inks are used for each set of hammer lines, it will

Fig. 40: The chart for plotting the chimes



Musical clock...

simplify the plotting out of the positions for the pins.

To do the plotting, put a dot on the appropriate hammer line, and if the note is a crotchet put the next dot on the following division under its appropriate hammer line, but should the first note be a semibreve miss one division and put it on the next division; and so on. It is helpful if a friend calls out the note while one does the plotting.

The chart when fully plotted is stuck to the barrel with Bostik cement and all the dots centre popped on to the barrel. The rest of the work is the same as that of the chime barrel.

A few hints on the general assembling of the movement may prove useful. The wheels of the time train should first be put into position on the back movement plate. First the centre wheel, then the great wheel and barrel, then third wheel and escape wheel; then position the front centre movement plate and put the screws into the pillars.

Now assemble the musical train. The first item is the stud for the maintaining click; see that this engages properly with maintaining ratchet. Screw in position the bottom bracket of the vertical fly and position the great wheel and arbor, then the second wheel, cam wheel, warning wheel, followed by the two idler wheels, and finally the arbor of the musical locking lever No 2. The front movement plate can now be put on and screwed to the pillars.

Assembling chime train

The stud to the musical locking lever No 4 should be screwed to the back movement plate. It must be arranged that when the lever is in its normal resting position the long step of the cam on the cam wheel should be against the stop block of the lever, and at the same time the pin in the warning wheel should have about half a revolution of run to the stop block of the musical warning lever.

Assemble the chime train, great wheel and barrel first, followed by second wheel, pallet wheel, warning wheel and the idler. The relative position of the pallet and warning wheels is important. To get these right the rack and rack hook must be temporarily assembled.

When the gathering pallet wing is locked by the pin in the rack, the pin

in the warning wheel must have a run of about a quarter of a turn of the wheel to the stop block of the lifter. The front plate must be lifted for adjusting these two wheels.

The rest of the parts should now be assembled, and attention given to the notch in the disc on the end of the chime barrel. Its correct position is found by making the chime barrel rotate and perform the four last peals as used at the hour.

As soon as the last hammer has been released by the pin in the barrel the disc on the latter should be marked and the notch filed for the pin in the locking arm to fall into. With the chime barrel locked, the disc with five slots attached to the striking barrel can now be adjusted so that the locking pin in the arm will fall centrally into the notches.

When the striking barrel is locked the hour hammer tail must be between two adjacent lifting pins in the disc attached to the striking barrel. This disc, it will be remembered, is made adjustable for this purpose. It should be stated that in doing these adjustments, the wheel work of the train should be kept in the forward position; this is important so that all back lash in the train is taken up.

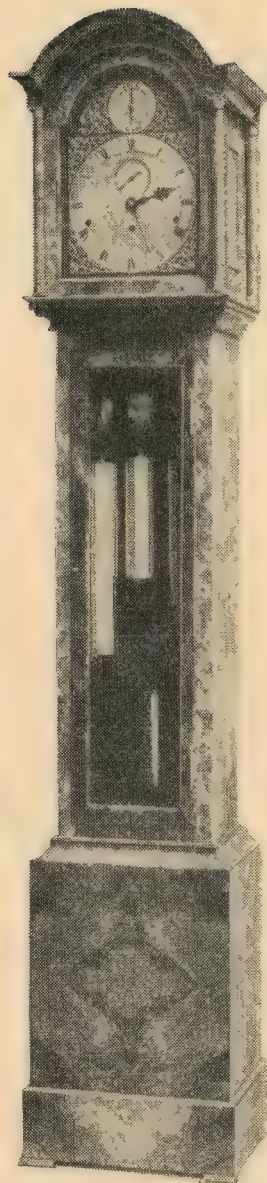
Trying it out

With all the levers assembled, the chiming and striking abilities of the clock can now be tried out. To get the adjustment just right, as between the chiming and striking barrels, the screw in the fixed arm between the contrate wheels is slightly loosened and the arm moved round the arbor a trifle. A minute amount of movement will make an enormous difference, so care is needed here.

The musical barrel adjustment is quite simple. With the cam wheel locked the hook on the end of the locking lever should be in the centre of the notch of the locking plate. This is easy to obtain as the locking plate is clamped by the setscrew to the extended pivot of the second wheel arbor. The tails of the hammers of the musical barrel should be about midway over the rest period of the musical barrel.

This adjustment can be done with the musical barrel in position by loosening the clamping screw in the set collar in the right-hand end of the barrel and turning the barrel round independently to its gear.

This concludes the construction of the clock. Nothing has been said about the construction of the period case as constructors may have their own ideas about this, but no doubt if there be sufficient inquiries a short article dealing with this matter could be published with the Editor's permission. ■



Author will deal with queries

Several queries have arisen from constructors in the course of this series on the M.E. Musical Clock and in the issue of March 14 Mr C. B. Reeve will deal with these and any other relevant matters.

MOUNTING ANGLE PLATES

BY GEOMETER

IN LATHE WORK, an angle plate mounted on the faceplate is the means of setting up types of components which have flat bases or sides but which cannot be conveniently held in a chuck or attached direct to the faceplate. In effect, the angle plate provides a fairly extensive platform on which components can be stood and clamped, at the same time with alignment assured in one plane—often an important factor.

Frequently, some initial work is required on components to prepare flat surfaces to stand on the angle plate. In production engineering, components are often first planed or ground on bottom or sides. But in model work, careful filing to remove major roughnesses is satisfactory, followed if necessary by packing up on the angle plate to avoid distortion.

Alternatively, the initial operation may be performed with components held in the chuck, or even clamped direct to the faceplate. And of course, once a surface has been machined from an angle plate a component can always be turned on to it for machining another at right angles.

A typical mounting for a small angle plate is as at *A*, left, where alignment is obtained from the two outside faces of the plate, one abutting

to the faceplate, the other forming the platform for components—the orthodox way, which is quite satisfactory where off-sets from the centre are relatively small. Space to swing such an arrangement is available on many lathes by provision of a gap in the bed.

The orthodox way of mounting an angle plate has, however, a number of serious drawbacks and only one feature slightly to recommend it, which is that the whole width of the platform is available to mount components. From every other aspect the mounting at *A*, right, is superior and is generally adopted on toolroom lathes with straight beds.

With the orthodox mounting, the

angle plate must necessarily be small in relation to the diameter of the faceplate, which in itself can prevent components being set up; and as the angle plate is moved away from the lathe centre there is a reduced hold on the faceplate and the corners seriously overhang, as at *B*, *Y-Y1*. Moreover, there is an increasing problem of out-of-balance, which always demands a balance weight.

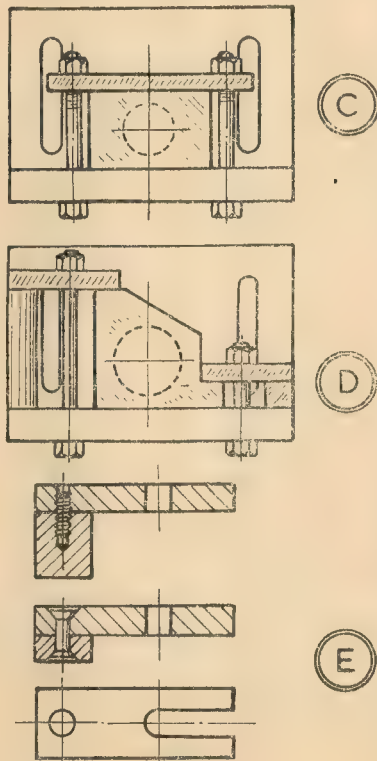
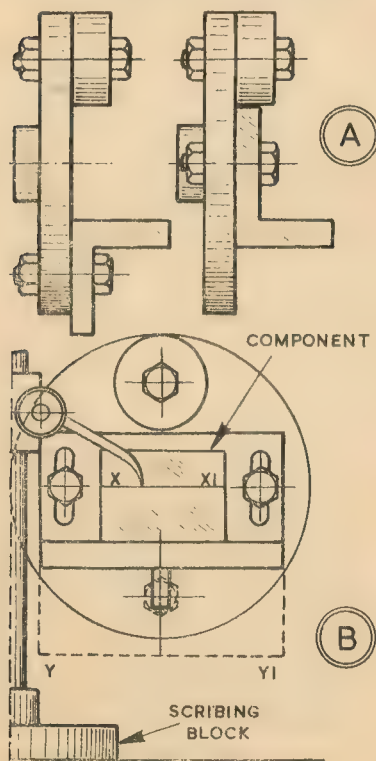
With the reversed angle plate mounting, however, a much larger plate can be used without the corners overhanging; the plate may often be twice as long as a normal type and is normally about three-quarters the diameter of the faceplate.

A very firm mounting can be obtained as at *B*, and the back of the plate over the centre line helps to act as a counterbalance. Generally, with a reversed mounting, a larger object can be swung on a straight bed lathe than with an orthodox mounting on a gap bed type.

A reversed angle plate only requires a simple wood pattern to obtain a cast-iron casting, which then has to be planed on the back and the mounting face—not expensive work to have done out. Alternatively, for small lathes, two pieces of flat steel plate could be electrically welded at right angles.

Setting of any angle plate from centre is checked with a component straight-line marked the distance from base, as at *B*, *X-X1*. Clamps hold the component, though these are not shown. A piece of flat plate across the bed supports a scribing block for its pointer to be adjusted to the line, when this is horizontal. Then, rotating the faceplate half-a-turn, the line should recheck the same; otherwise, the angle plate needs adjusting.

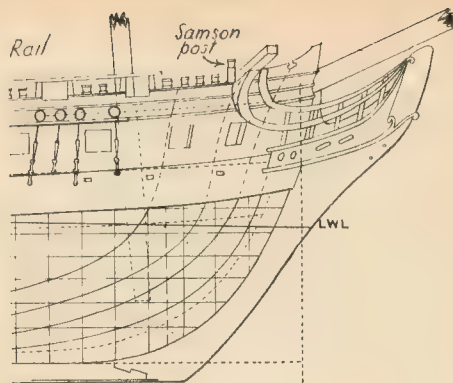
Components may be clamped in various ways, using a straight-across bar, as at *C*, or separate clamps, as at *D*; and packing or reaction blocks, instead of being loose, can be fixed to clamps by a length of studding or a rivet, as at *E*. Also, for convenience, clamps can be slotted. ■





The important job of rigging should be tackled next. In this instalment—the fourth—B. G. PHILLIPS provides full details

U.S.S. CONSTITUTION



THROUGHOUT the drawings the masts and spars and the various lines of the rigging have been given a reference number for identification when studying the various details.

These reference numbers are first seen on Sheet 2, identifying the points of attachment of certain rigging. A full list of these reference numbers is given in Table 3. Running gear for handling the sails has not been included in the table, but the lead of this rigging should be sufficiently clear from the details given on Sheet 6, and Sheets 10 and 11 to follow.

Sheets 8 and 9 show the standing rigging and by cross reference to Table 3 and the drawings of details there should be little difficulty in appreciating the position and lead of all rigging except that required for the working of the sails only. On Sheets 8 and 9 the exact position of attachment of some rigging has been shown rather out of place in the interest of clarity; these drawings should be considered to be diagrammatic only and the precise attachment of the rigging can be scaled from the various details on Sheets 2, 5, 6 and 7.

Vary thread size

In the rigging of models I consider it to be of the greatest importance to vary the size of the thread—or other rigging material used—in accordance with the various thicknesses of rope used in the actual ship. In my opinion this is only second in importance to the neatness of the attachment of the rigging, although in a model to the scale of *Constitution* it is impossible to reduce all rigging to true scale thickness. The difference in thickness between two threads is hardly apparent, but the overall effect in the finished model is remarkable.

The usual sizes of rigging in ships of the period are shown in Table 4, which gives the circumference of some of the most important standing rigging. Other rigging not shown in the table should be of a proportionate

size according to its importance and the work it has to do.

In the model the majority of the rigging is of linen and cotton thread, materials I am anxious to improve upon in subsequent models, but these are the simplest for the beginner to obtain and to practice with. Black linen thread was used for the standing rigging that is tarred in the actual ship, and white linen and cotton thread for running rigging, tackles and lanyards. The white thread is suitably coloured to a very pale shade of brown and beeswaxed to kill fluff. All knots and other points where glue is used were varnished to prevent the glue being loosened by dampness.

For the ensign halliards wire coloured white was used to enable a realistic curve to be obtained. The ensign is the only bit of "life" in the model, all the rigging being taut.

It was considered too difficult to obtain a neat appearance by trying to represent the curve in the rigging caused by the pull of gravity, but great care must be exercised to ensure that no distortion takes place by any rigging being pulled too tight, and a constant check must be kept on the effect of the pull on the spars and rigging as a whole as work proceeds.

Footrope stirrups were made of fine wire to obtain a neat finished appearance and to hold the necessary sag in the footropes.

Deadeyes were made of fine wire. The lower deadeyes being a length of wire bent round into a circle, twisted in three places to form a representation of the chains (as shown in Fig. 4) and the ends secured by pushing into holes in the side of the hull. The upper deadeyes were just simple circles of the same wire, to which the ends of the shrouds were seized. Lanyards of fine thread were rove through the two rings, pulling the shrouds to the right tension, and the rings were filled with plastic wood.

The scale was too small to require the making of eyes and mousing to form the collars of the stays so that they were merely seized in a bight round the head of the masts. The

seizing was made as small as possible, and before finally finishing off and glueing the stay was given the correct tension by pulling the end of the bight through the seizing, see Fig. 5.

Single French knot

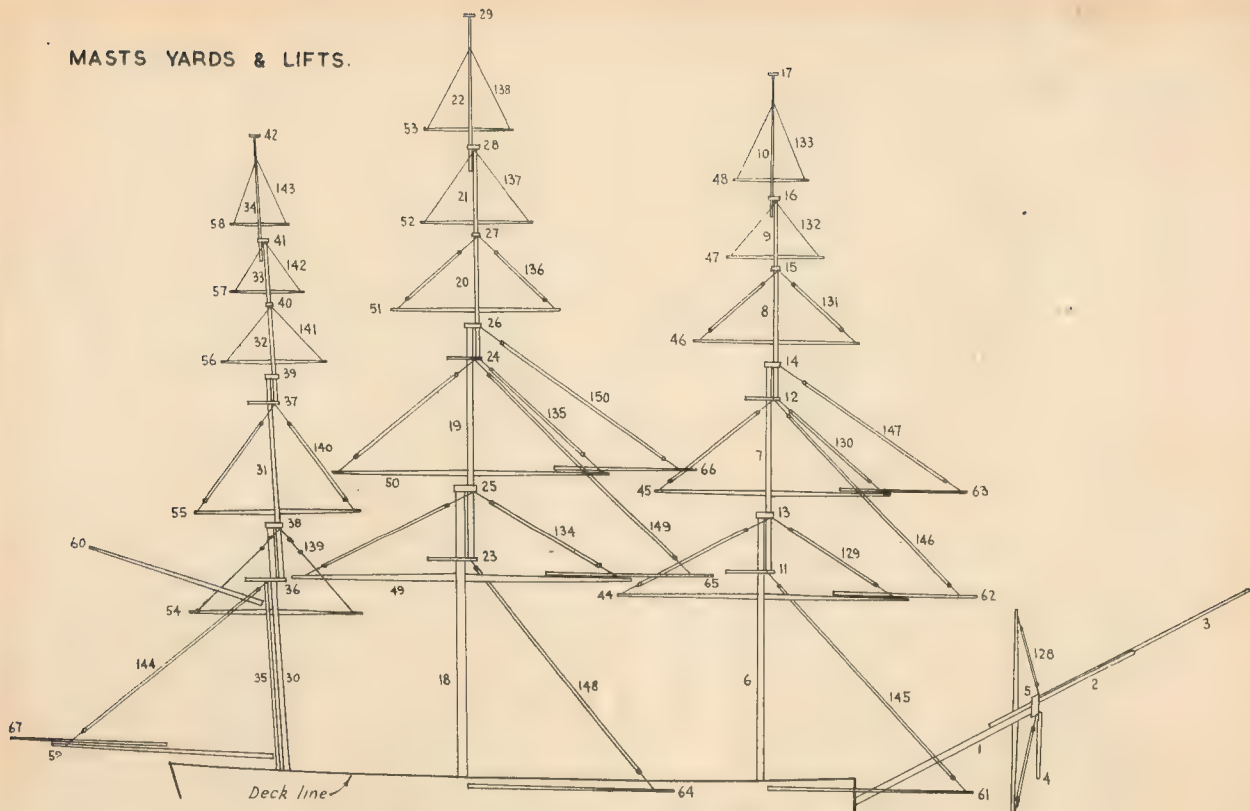
To represent the blocks, which, in the actual ship would vary from 13 in. to 6 in. and be barely visible in the scale to which I was working, the standing end of tackles and block pendants were knotted round the running part with a single French knot. After all lines were pulled taut the knot was finally tightened and the loose end cut off close (see Fig. 6). A touch of glue on the knot and a little shaping between the fingers before the glue set gave the knots a sufficiently neat appearance to represent blocks.

Sheet 6 shows details of the yards, with the various blocks and fittings. Rigging for the sails would be omitted unless sails are to be fitted to the finished model. Buntline blocks, studdingsail yards and similar items would be omitted unless sails were to be fitted to the finished model. I have included studdingsail booms in the drawings, as these properly form part of the spars and indicate the number and spread of the sail carried. Studdingsail boom irons were made of wire, one end of the outer boom irons being flattened before bending (Fig. 7).

The number of blocks required to be stropped to the yards diminishes on the upper yards—and on the royal and skysail yards the braces and lifts have no blocks, but are attached by eyes passed over the end of the yard arm. Fig. 8 shows how this is done in practice and in the model. By careful thought it is possible to make a single length of thread represent more than one line of rigging by knotting round a yard—or other point of attachment—in the middle of its length, and by using this knot to secure the end of other lines of rigging to avoid a number of knots and stops which would build up to an overscale size

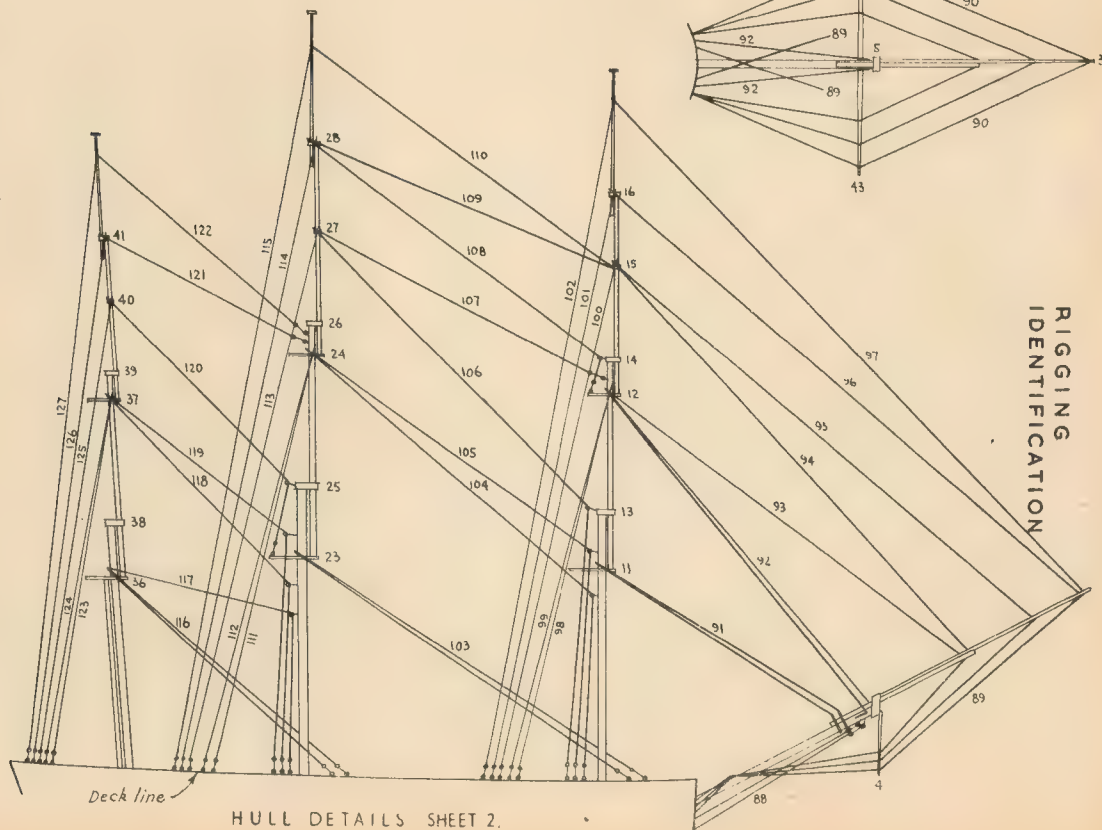
● Continued on page 311.

MASTS YARDS & LIFTS.



MAST & SPARS. DIMENSIONS SHEET 4.
DETAILS SHEETS 5,6.

STAYS.



RIGGING
IDENTIFICATION

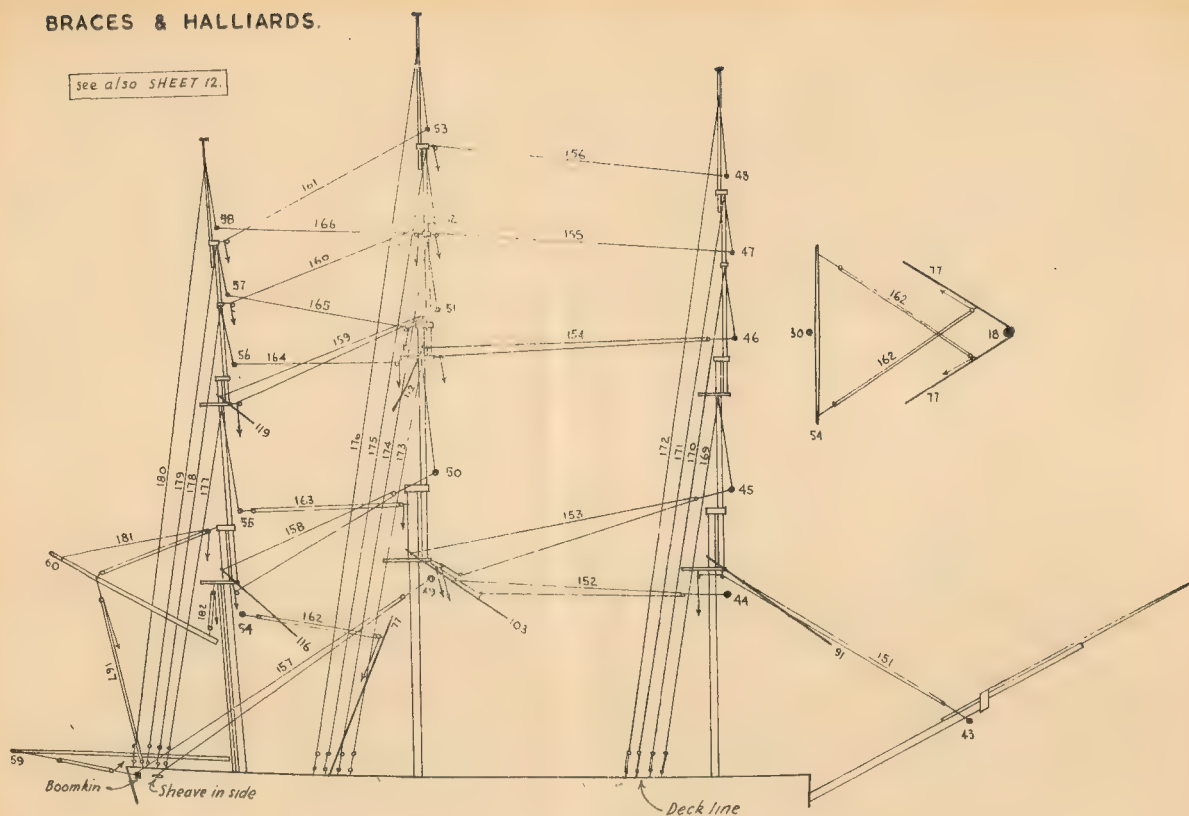
HULL DETAILS SHEET 2.

SEE ALSO SHEET 12.

SHEET 8

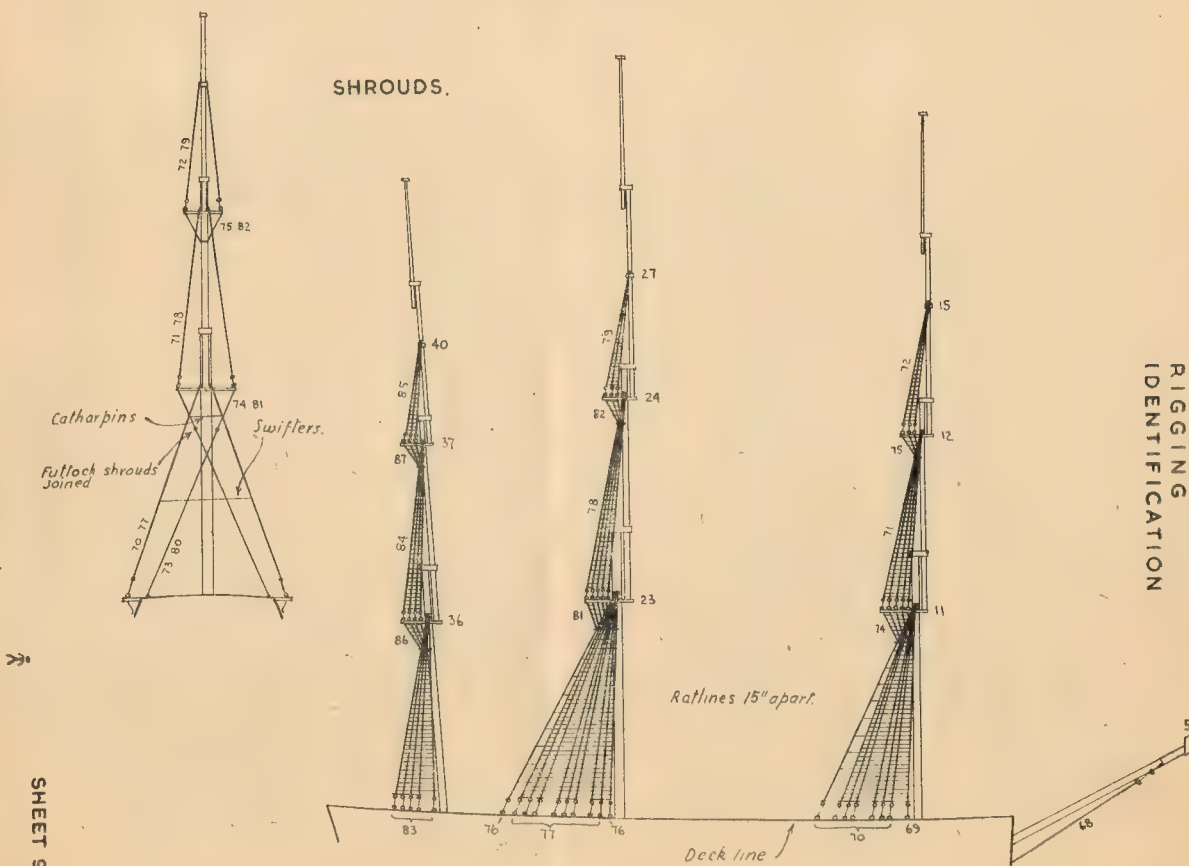
BRACES & HALLIARDS.

see also SHEET 12.



HULL DETAILS SHEET 2.

SHROUDS.



RIGGING
IDENTIFICATION

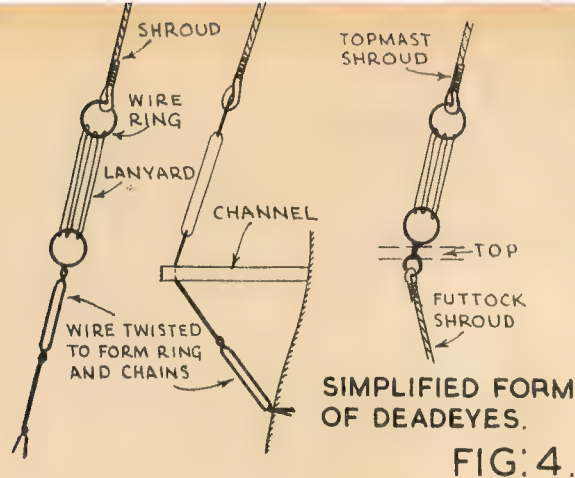


FIG. 4.

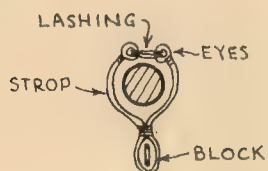
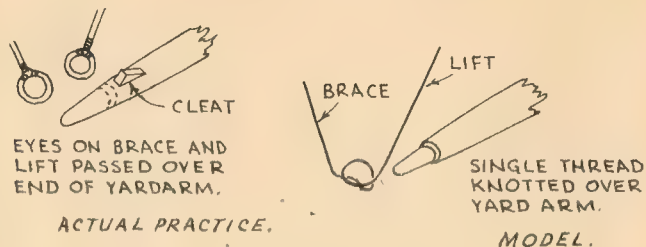
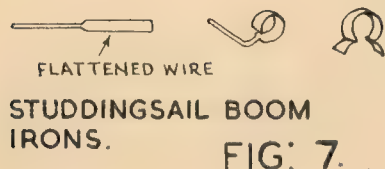
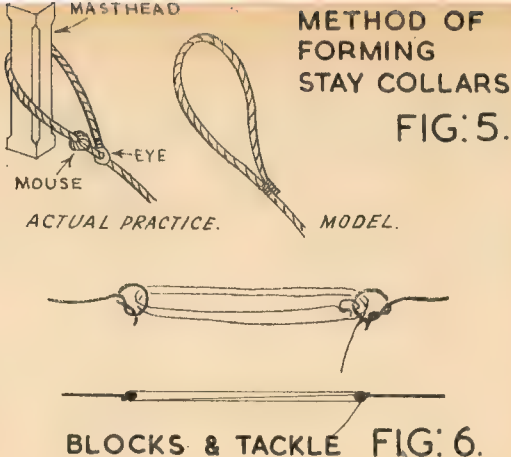
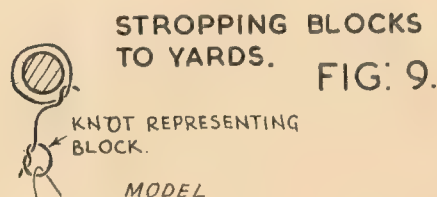


TABLE 4



U.S.S. CONSTITUTION		See SHEETS 8 & 9.		
SIZE OF STANDING RIGGING.				
Nº & name		CIRC.	DIAM.	Diameter at 20 ft to 1 inch
103	MAIN STAY	15"	4 ¹³ / ₁₆ "	0.020"
105	TOPMAST STAY	7 ¹ / ₂ "	2 ³ / ₈ "	0.010"
77	SHROUDS	7 ¹ / ₂ "	2 ³ / ₈ "	0.010"
78	TOPMAST SHROUDS	3 ³ / ₄ "	1 ³ / ₁₆ "	0.005"
91	FORE STAY	12"	3 ⁷ / ₈ "	0.016"
92	TOPMAST STAY	6"	1 ¹⁵ / ₁₆ "	0.008"
70	SHROUDS	6"	1 ¹⁵ / ₁₆ "	0.008"
71	TOPMAST SHROUDS	3"	1 ¹⁵ / ₁₆ "	0.004"
116	MIZZEN STAY	6"	1 ¹⁵ / ₁₆ "	0.008"
119	TOPMAST STAY	3"	1 ⁵ / ₁₆ "	0.004"
83	SHROUDS	3 ³ / ₄ "	1 ³ / ₁₆ "	0.005"
84	TOPMAST SHROUDS	2 ¹ / ₂ "	1 ³ / ₁₆ "	0.003"
	TOPGALLANT STAYS	3"	1 ¹⁵ / ₁₆ "	0.004"
	TOPGALLANT SHROUDS	2 ¹ / ₂ "	1 ³ / ₁₆ "	0.003"

and give a clumsy appearance. This is particularly important on the smaller spars. Fig. 9 shows an actual method of stopping a block to a yard and the method employed in the model.

The long tackle blocks on the lower yardarms were made of wood and the pendants stiffened with glue so that they hung vertically with no tendency to curl. Alternatively, if the blocks were made of lead the weight might permit them to hang naturally.

It is presumed that lifts, studdingsail halliards, etc., were brought down to the fife rails, but I have no information as to their positions. It is important to remember that any lines belayed to the fife rails, pin rails and eyes in the deck must be attached thereto before the masts are stepped and carried up to the yards, etc. afterwards. Otherwise it is impossible to secure the ends neatly. Studdingsail boom inhauls and outhauls and other such gear that might be rigged would be belayed at the tops.

● To be continued.

CARBURETTORS

ancient and modern

In these days of fuel restrictions the history of carburation can provide lessons in economy and efficiency. This is the first of two articles

By EDGAR T. WESTBURY

IT IS WELL KNOWN that the all-round performance, no less than the economy, of all types of internal combustion engines is very largely dependent on the quantity control and admixture of fuel and air admitted to the cylinder, in other words, carburation.

The majority of queries submitted by readers on i.c. engines are concerned with this matter and the present and (we hope !) temporary difficulties in fuel supplies have increased the urgency of their requests, not to mention their number.

A good deal of my research work, both professional and amateur, on large and small engines has been devoted to carburettor design, and I have dealt with this subject in many articles published in past issues of the *MODEL ENGINEER*. There have been quite a number of books published on carburettors but most of them, particularly the more modern ones, concentrate mainly on the cataloguing of contemporary types rather than explaining basic principles; thus their value to the student of engine design tends to be restricted.

I am a great believer in getting down to first principles in these matters, and in this respect I find the earlier textbooks, on this and many other subjects, much more interesting and informative. The pioneer writers on engineering subjects had a very clear and long-sighted view of the problems they were dealing with and it is surprising how many modern developments were visualised, and ideas anticipated, by such writers as Dugald Clerk, Rankin Kennedy and Edward Butler, in the early years of this century.

It is reported of the great Henry Ford that one of his favourite slogans was "To Hell with History!"—but if that were indeed true, I believe that this great genius meant it in a very different sense to that in which it is

often interpreted. Too many people are all too ready to forget or deride the lessons of history, but no progressive engineer can afford to do so. History is an edifice on which to build, but not a rut in which to get stuck. Many would be go-aheads are but as squirrels in cages, because they do not take advantage of what has been done before, and thus keep on perpetrating old mistakes or nursing old fallacies.

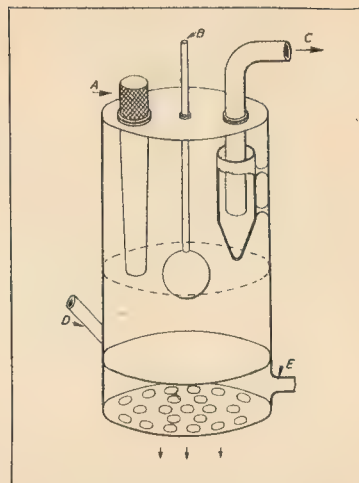
In the many queries I receive on carburation, I find that there is a good deal of misconception on basic principles and most of the queries would be unnecessary if the readers first took the trouble to grasp these principles and then applied their own intelligence to them. A great deal can be learnt by reverting to the older types of carburettors and following the progress of their design.

SURFACE CARBURETTORS

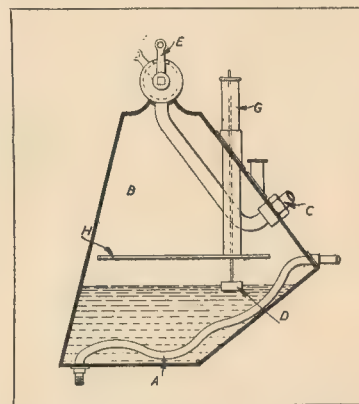
The first designers of liquid-fuel engines found the simplest way to supply fuel to the engines was to "carbure" the air by bringing it into close contact with a volatile hydrocarbon spirit on its way to the engine cylinder. This was the principle employed by Gottlieb Daimler, Carl Benz, Lanchester and De Dion, though the details of its application varied a good deal.

In the Benz carburettor, for instance, the air was caused to pass through the fuel in the main or subsidiary tank, emerging in bubbles, each of which carried over its quota of the essential vapour (Fig. 1). The Lanchester carburettor utilised the capillary attraction of a gallery of wicks to carry the fuel into the air passage and expose a large surface to the air flow.

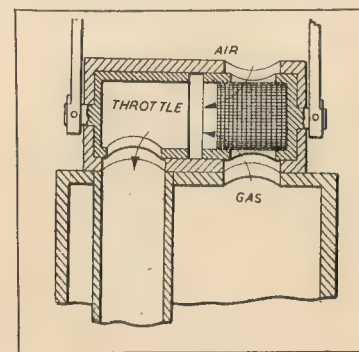
In the simple arrangement used for De Dion motorcycle engines (Fig. 2) a horizontal plate slightly above the surface of the fuel in the tank deflected the air so that it mingled with the vapour rising from



Above, Fig. 1: Benz surface carburettor, bubbling type. (a) air intake; (b) indicator float; (c) induction pipe; (d) fuel inlet; (e) exhaust heater inlet



Above, Fig. 2: De Dion motorcycle carburettor. (a) exhaust heating pipe; (b) fuel tank; (c) induction pipe; (d) indicator float; (e) throttle; (g) slide tube to adjust deflector plate (h). Below, Fig. 3: Twin-tap mixture control of the De Dion carburettor



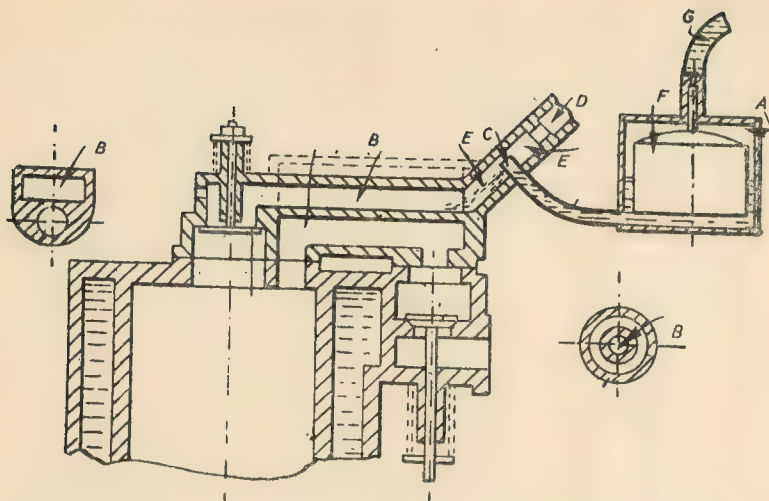


Fig. 4: The original Maybach carburettor, 1893. (a) float chamber; (b) induction pipe; (c) jet; (d) intake; (e) choke tube; (f) float; (g) fuel inlet

the fuel and carried it to the engine. This plate had to be regulated to suit the fuel level, and a float was fitted to indicate this, though it did not control the feed in any way.

In these primitive carburettors, no attempt was made to provide quality control of the fuel, and the richness of the mixture had to be regulated by the driver of the engine, usually by a tap which enabled extra air to be admitted to dilute over-rich mixture from the carburettor (Fig. 3).

The height of the deflector plate in the De Dion carburettor also affected mixture strength and had to be gradually lowered as the level of fuel in the tank diminished. Climatic conditions also complicated control; on a cold day, it was difficult to induce fuel vapour to rise, and exhaust heating coils or jackets were introduced. If the vehicle encountered a bump or a pothole in the road, splashing would cause temporary enrichment of mixture and constant juggling of taps was called for.

Nevertheless, many users of these devices had a kind word to say for them; they were used by many model engine designers, including the late Ted Vanner and F. Arkell, the latter retaining them in fairly recent years, to my knowledge. A modern version of the wick carburettor has been experimentally tried within the last year or two, in which quantity control is effected by exposing a limited area of wick surface.

One of the carburettors I designed and patented employed a metallic-filament wick supplied with fuel by a metering orifice. Many readers have asked my advice on the possibility of using them on small engines,

including the compression-ignition type using ether-based fuels.

Apart from the disadvantages already mentioned, however, there is one very serious difficulty in the successful employment of surface carburettors nowadays, namely, the nature of the fuel available.

In the early days, the fuel used in motor engines, known variously as petrol, gasolene, benzine and mineral naphtha, was a very volatile constituent obtained by simple distillation of crude petroleum. Originally it was not too easy to dispose of, as it was outlawed for illuminating purposes because of its dangerously low flash point; the advent of the i.c. engine must have been hailed as a gift from heaven by the oil companies!

This fuel was readily taken up and completely evaporated by the air stream, even at normal atmospheric temperature, and mixing and combustion problems were almost non-existent. With the modern demand for enormous quantities of motor fuel, however, it became necessary to increase the yield of fuel from the crude oil, and the method of catalytic "cracking" at high pressure and temperature has replaced simple distillation. Modern fuels contain a much wider range of specific hydrocarbons than before, some of them less volatile than others, and quality is assessed in octane value instead of readiness to evaporate, or even calorific value as such.

Modern fuels

I should like to make it clear that this does not make modern fuel less suitable or efficient for its practical

purpose than it was in the old days; actually it is considerably better because the important qualities of anti-detonation and rate of flame propagation have been improved out of all recognition.

But when used in a surface carburettor, not only is it more difficult to produce combustible vapour, but selective evaporation of the various constituents would occur, the lighter being evaporated first and the heavier left behind; the extreme case being in blended fuels, and fuel-oil mixtures, the oil of course being inevitably left behind altogether.

The special fuel used for petrol-air gas generators, in which surface carburation is still employed, would be much more successful, and I believe that lighter fuel was found satisfactory by Mr Arkell. As a general conclusion, however, it may be said that surface carburettors are unsuitable for use with the fuels now produced for use in internal combustion engines.

SPRAY CARBURETTORS

In order to enable an engine to run continuously without frequent attention, and also to ensure that the fuel is always used economically and to the best advantage in all circumstances, some method of automatic control of the quantity of fuel supplied is a necessity.

The idea of using a metering orifice to control fuel supply is as old as the surface carburettor, but owing to practical difficulties in applying it, some years elapsed before it came into general use. Theoretically, at least, there are certain disadvantages in using a spray device as compared to surface carburettors, especially if the intention is to vaporise the fuel.

It is not easy to spray liquid into an air stream so finely that it is vaporised and does not tend to re-deposit in liquid form, especially in long and tortuous induction passages. Formation of spray demands the exertion of some force at the spray orifice, and in practice this can best be obtained from the air stream by restricting the throat of the air passages near the spray jet so that the air moves at considerable velocity in this region; in fact, the air speed must be kept fairly high throughout the whole induction tract to prevent redeposition of fuel.

Effect on volume

This in turn can only be done by creating a partial vacuum so that the pressure in the cylinder when induction is complete never reaches atmospheric level, and volumetric efficiency is thus lowered. The only practical remedy for this is forced induction, or "supercharging," but

Carburetors . . .

this calls for the exertion of still more power and also adds mechanical complication.

The depletion of volume thus caused, however, is not so serious in comparison to surface carburation as might appear, because the spray from the jet does not take up so much room as surface vapour, and the amount of combustible mixture which can be drawn into a cylinder of given capacity is not reduced in proportion to the lowered pressure.

Air velocity can also be used to advantage in high-speed engines by exploiting the "ram" effect, which modern designers have employed to increase efficiency. Long after the general adoption of spray carburetors it was found that "wet" spray, so far from being at a disadvantage, was more conducive to good combustion than completely vaporised fuel.

In common with many other epoch-making inventions, there was great controversy as to who was the original inventor of the spray carburetor and the rival claims to this distinction by Maybach in Germany, and Butler in this country, were hotly disputed.

If, however, the original patent drawings of the respective claimants are examined there does not seem to be much doubt as to which was the more progressive and scientific device. The Maybach carburetor (Fig. 4) is a relatively crude device, consisting of a spray jet, supplied with fuel from a float chamber and located in the inlet pipe, with a restrictor or "choke tube" on the intake side to increase air velocity and assist atomisation.

Advanced design

On the other hand, the Butler "inspiration," as it was called (Fig. 5), anticipated many features of much more modern carburetors, including automatic air regulation by an expanding choke on the "constant-suction" principle, the annular diffuser, and subsidiary air bleed, to produce an air-fuel emulsion at the point of emergence into the main air stream. Both air and fuel supplies were capable of regulation, the former by variable spring loading and the latter by a fine-adjustment screw valve.

In both carburetors, constant fuel head was obtained by float feed, but the Maybach float chamber resembled the modern type much more closely than that used by Butler, which was comparable to the domestic "ball-cock" but just as effective in practice, or even more so.

Nearly all the early spray carburetors were modifications of the Maybach type—Butler was, in my opinion, too far ahead of his time to be fully understood—but for the purpose of engine control they were equipped with throttle valves and extra air apertures, either manually or automatically controlled. Some of them developed into fearfully and wonderfully conceived contraptions, of enormous bulk, and more like a gasworks or an oil refinery than an engine accessory—but this did not mean that they did their job any more efficiently.

Some very ingenious alternatives to the spray carburetor were invented, including modified surface types such as the Dentan, in which a porous ceramic cylinder was used to produce a large surface evaporation area and this was controlled to suit requirements by a pool of mercury which varied in height according to engine

which were positively fed by means of a fuel pump, either mechanically operated or actuated by the fluctuating suction in the induction pipe. The latter, of course, were not suitable for multi-cylinder engines, in which the air flow was more or less continuous, and they were not very reliable at high speeds either.

The alternate pressure and suction in the crankcase of a two-stroke engine, however, produced a much more positive action, and one example of a fuel pump operated by a diaphragm in the engine crankcase, that of the Petter electric generating engine, survived for many years.

In this case the jet, which was located in the transfer passage of the engine, was not directly under pump delivery pressure but was fed at atmospheric pressure from a small spill chamber, excess fuel being allowed to flow back to the tank which was in the engine base.

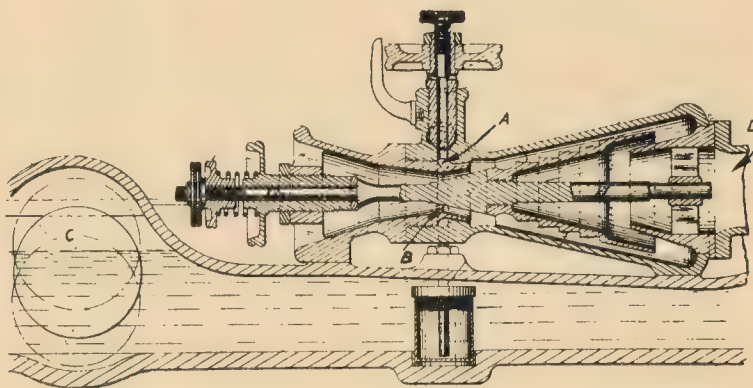


Fig. 5: The Butler "inspiration," 1889. (a) fuel inlet; (b) air intake; (c) float; (d) inlet pipe

suction, on the principle of the U-tube manometer.

The Motasacoe carburetor had a float chamber, but not a jet, the fuel being spread in a film all around the annular wall of the air passage which enclosed the chamber.

In the ingenious Ellehammer carburetor, an air turbine operated by the air passing through the induction pipe was used to raise fuel by means of a light spiral-spring belt which passed down an enclosed tube to a pulley in the petrol tank, and thus acted as a kind of capillary-action chain pump. On reaching the drive pulley on the turbine shaft, the entrapped fuel, or most of it, was swept away by the stream of air and effectively mixed with it.

Some early carburetors had jets

The ingenious Gobron-Brillic opposed-piston car engine had a fuel metering device in the form of a rotary sampling valve, of conical form, with a number of equidistant cavities or cells, each of which was filled with fuel in turn from a gravity tank and then brought into line with an outlet port which delivered it to the induction pipe.

The valve was rotated by a pawl and ratchet from the engine, a governor mechanism being provided to lift the pawl at excess speed and stop the rotation of the valve, so that the engine was deprived of its fuel ration until it behaved itself.

It is interesting to note that an injection system on this principle has recently been reintroduced for racing car engines. ■



THE 1957 BOAT SHOW

Build your own craft—cost is low

Rowing dinghies for £10... small boats under £50. And, points out EDWARD BOWNESS, by adopting the kit method, building is really simplified

[Picture by Daily Express]

THE third National Boat Show at Olympia demonstrated more than ever how strong is the national interest in ships and the sea.

The exhibition was confined to small craft. Many of these are within the reach of the home builder—in fact some of the rowing dinghies can be built for less than £10, and small boats (for sail or outboard motors) for well under £50.

A number of firms displayed designs and materials prepared in the same way as the kits for model boats, which can be built into quite serviceable craft of reasonable size at a cost well within the pocket of the average man. These would appeal especially to the model engineer, who is skilled in the use of tools and prefers to trust himself to something made by his own hands rather than to something bought "off the shelf."

The show is now firmly established. The 1957 exhibition had more than 200 exhibitors—over twice as many as in the first show two years ago. This is not surprising in view of the increasing number of people who are taking up sailing and the corresponding effort being made by the manufacturers to cater for their needs.

New methods of construction are being developed, the most notable being glass fibre and the use of hot moulded plywood.

Since the war hulls for sailing dinghies and other craft have been made of plywood on mass production lines. A wide range of boats is being produced by this process—from a 7 ft 6 in. rowing dinghy to a 26 ft sailing craft for family cruising. One interesting development is the one- or two-seater boat divided in half so that it can be carried on a sidecar

chassis or in the boot of a small car.

Glass fibre is being used extensively in the production of hulls for boats of all sizes, ranging from small dinghies and sea-scooters to hulls too big to be exhibited in the show. I saw pictures of one over 50 ft long made in a single moulding—and lifeboats for large ships are being made in this way, too.

Donald Campbell's *Bluebird* was shown on one of the stands, a very important exhibit for power-boat fans interested in the best hull form for speed.

On the same stand I saw the 18 ft catamaran *Endeavour* which has attained the phenomenal speed of 26 knots under sail alone. There were other catamarans on show, all of the greatest interest to young experimenters interested in maximum speed under sail.

In contrast to the shiny, colourful types that dominated the exhibition, there was the home-made 26 ft yawl *Orenda*, built by two amateurs in Toronto, and sailed across the Atlantic to Devon last summer. She was exhibited just as she was on arrival, with obvious signs of wear and tear; her underbody, for instance, was still encrusted with shells and marine growth.

The road motor scooter has produced its counterpart for use on water. This has a wide, flat hull, usually of glass fibre, with a raised portion aft under which is located the engine, and on which one or two people sit—in tandem style—with handlebar steering amidships. Its speed attains 20 m.p.h., which opens up possibilities of very exciting sport on the water. As its cost is considerably less than £200 it will have a great appeal for young people out for a thrill.

At the two earlier exhibitions there

was a display of ship models and marine paintings. This year there was neither; presumably the exhibition now needs no additional stimulus. But there was a small stand at which a MODEL ENGINEER contributor—R. J. Collins—was demonstrating ship modelling. He was working on models of *Mayflower* and of the sixth-rate ship he described in *Ships and Ship Models* last year. In this section, the Build it Yourself Boatyard, small craft were being built from kits of materials supplied by various firms. This was a great attraction for the man who loves to use tools, among which model engineers must certainly be classed.

In the same section I saw a huge block of timber about 8 ft long × 3 ft square which had been donated to the *Cutty Sark* Society by the Canadian Government for the clipper's new figurehead. It was sent from Newfoundland—and is built up of laminations of yellow pine, partly owing to the difficulty of obtaining timber of this section and partly to ensure having sound wood all the way through. The carver is Mr Arthur Levison, well known in model yachting circles, and who is probably the last carver of figureheads in this country.

The show was divided equally between yachts, motor boats and engines—and examples of each type were shown in all sizes and at all prices. A number of fine ship models were to be seen on the stands, and I recognised some of them as having been shown originally in Model Engineer Exhibitions.

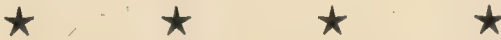
There is no doubt that the show has come to stay, and that many who considered the hobby as being too expensive for their means will revise their ideas and soon be found "messing about in boats." ■



Left: A general view showing the boat pond and car track. Right: Mr R. Meirans' 15 c.c. class B hydroplane strolling along at 50 m.p.h., a speed which has since been bettered

GALA DAY AT SYDNEY

The Sydney S.M.E. is one of the most progressive societies in Australia. On these two pages we present pictures of some of their recent activities



"FIFTY YEARS is not five years and 50 years is not to be forgotten. How many old remembrances will float along with the breeze?"

These words in the bulletin of the Sydney Society of Model Engineers last November expressed the mood of the Golden Anniversary celebrations, already reported in *MODEL ENGINEER*.

Sydney S.M.E. was inaugurated in 1908 but its origins lie two years further back, in 1906, when a small group of enthusiasts banded together and called themselves the Summer Hill S.M.E. From these beginnings in the Australia of the early twentieth century the society has grown into an organisation of nearly 300 members infused with the energy of a country that can still think of itself as new.

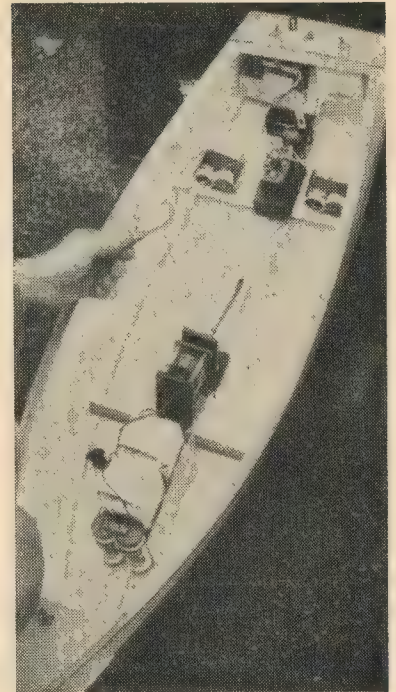
In all these years the society has not

lost the pioneering impulse that brought it to birth and kept it alive through the crucial early stages when 1914 was looming nearer. Sydney S.M.E. is only five years older than the Commonwealth of Australia, for federal union dates from 1901.

The Australian spirit sparkles on every page of the bulletin which reaches Noel Street month by month. While never failing to enjoy the future, Sydney S.M.E. looks back with pride to the past and with confidence to the future.

"In fifty years," writes the editor—Miss Elizabeth Wood, of 78, Wilga Street, Concord West—in another issue, "the S.S.M.E. has come a long way and with the years ahead it will go further."

Here are some pictures to give an idea of what the society had to show on its Golden Anniversary Gala Day.



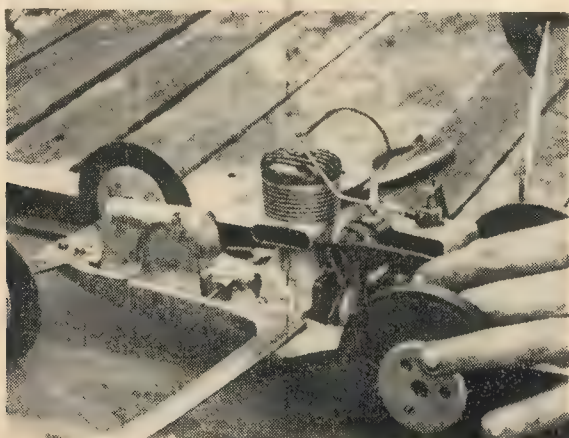
Showing the arrangement of the motor and controls in a radio controlled launch which was constructed by Mr L. Trayers



Left and right: One of the most beautiful vessels in the club is the steam yacht PLANET. Built by Mr A. Matthews, it is powered by triple expansion engines complete in every detail. It is 8 ft bow to stern.



Below, left and right: Speeds of over 120 m.p.h. are common on the track. These pictures show the mechanism of one of the 100 m.p.h. racing cars.



Left: A section of the gauge "O" track which has an enthusiastic following.



Right: Bill Hutchings' RANI water-cooled 30 c.c. launch chugging along, followed by a self-made tidal wave.

VIRGINIA

Continued from 21 February 1957, pages 282 to 284

In this week's instalment L.B.S.C. describes the construction and erection of the tender trucks of this vintage American locomotive

WHILE THE PRINCIPLE of the tender trucks for *Virginia* is the same as that of the engine truck, the frames are outside the wheels, and this calls for a different method of construction. It would be sheer waste of labour and material to cut the top frame-bars and centre-piece from a single plate, so separate components are used and the complete assembly brazed at the joints.

It is possible that castings comprising centre section, rubbing plate, top bars, and pedestals all cast integral, may be available from our advertisers, and the use of these would save a lot of work. The castings would only need cleaning up with a file, the pedestal jaws truing up, and the rubbing-plate facing off and drilling; operations which do not need any detailing out.

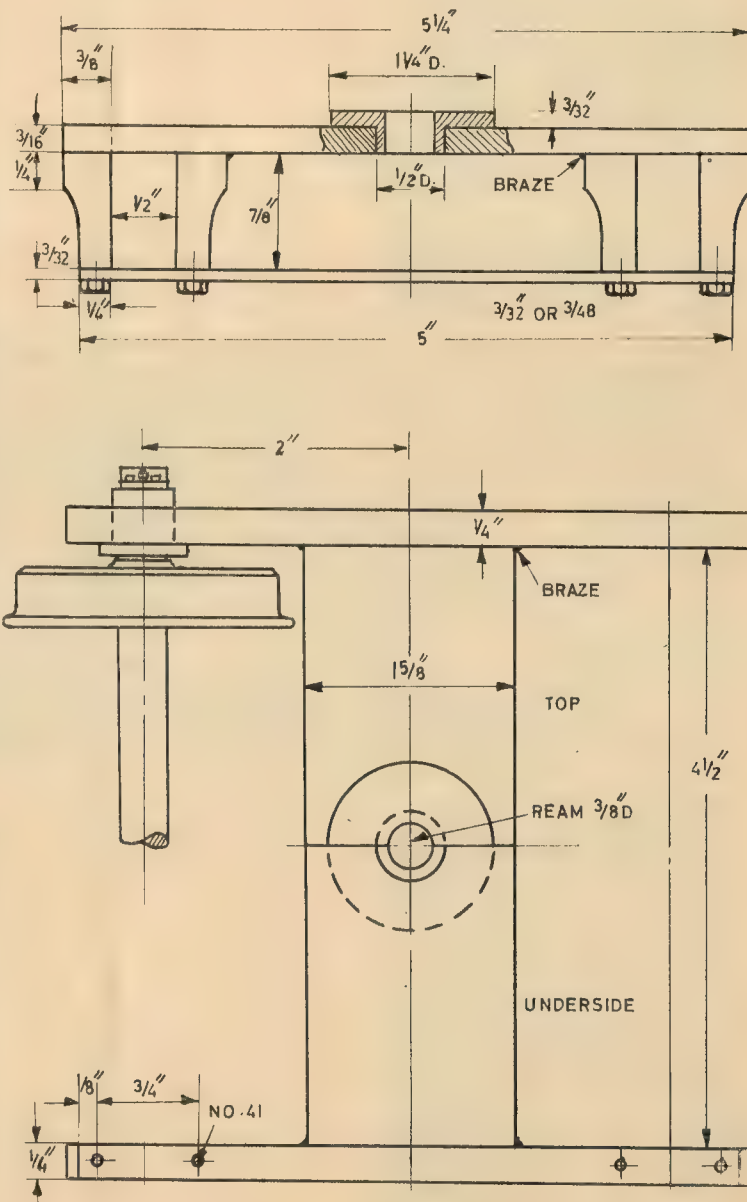
The top frame bars on a built-up truck will need two pieces of $\frac{1}{2}$ in. $\times$ $\frac{3}{8}$ in. mild steel, squared off at the ends to a length of $5\frac{1}{2}$ in. The centre-piece is a $4\frac{1}{2}$ in. length of $1\frac{3}{8}$ in. $\times$ $\frac{3}{8}$ in. mild steel; this must also be dead square at the ends. If a milling-machine is not available it can be held truly in the four-jaw chuck and the ends faced off with a roundnose tool set crosswise in the rest.

Simple method

Drill a $\frac{1}{2}$ in. hole exactly in the middle. To hold it in position for brazing to the frame bars use two $\frac{1}{16}$ in. or $\frac{1}{72}$ screws put through clearing holes in the thickness of the frame bars (No 51 drill) into tapped holes in the ends of the centre-piece, about 1 in. apart.

If the pedestals are cut from $\frac{3}{8}$ in. $\times$ $\frac{1}{2}$ in. mild steel, no machining will be required on the sliding faces. Eight will be needed for each truck and all must be exactly the same length. Tip for beginners who want to do the job quickly and accurately; chuck a length of above section steel in the four-jaw and set to run truly. No need for absolutely accurate setting; approximate is good enough.

Put a piece of round rod, any convenient size, in the tailstock chuck and run it up until it touches the end of the rod in the four-jaw. Set your parting-tool to part off carefully a



Above : Details and dimensions of the built-up tender truck

Right : Details of the spring assembly and the axlebox

$\frac{7}{8}$ in. length, setting the tool at such a height in the tool-holder that it parts off without leaving a pip.

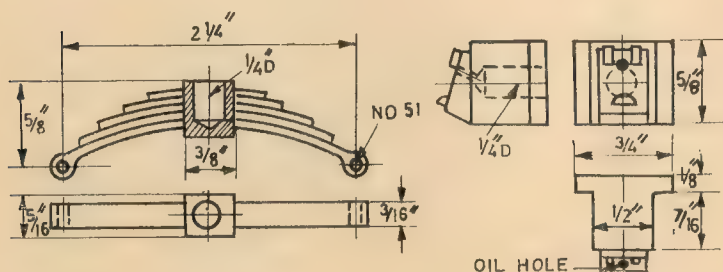
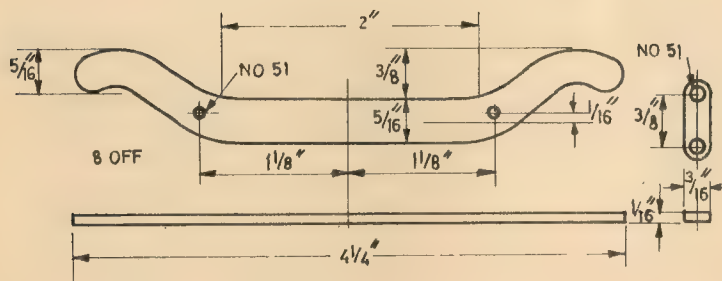
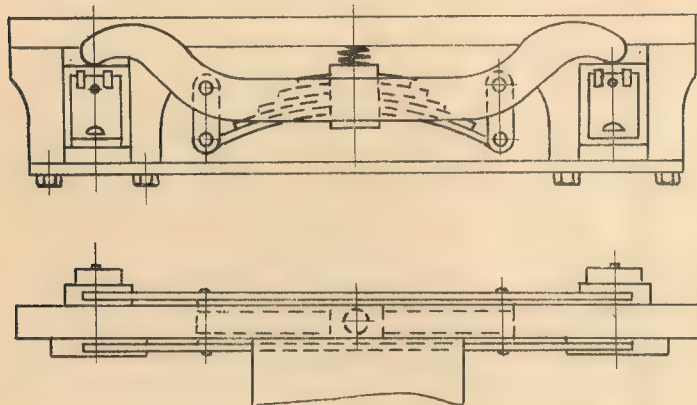
Slack jaws 1 and 2 of the four-jaw chuck, pull out of the bar until it touches the stop in the tailstock chuck, tighten jaws, part off, and repeat operation until you have 16 pieces. They should all be the same length with nicely squared ends if neither the rod in the tailstock chuck, nor the slide-rest, have been moved during the operation.

Spacing inner pedestals

Drill a No 51 hole in the frame bar directly above the location of each

pedestal then clamp a pedestal at the end with a toolmakers' clamp, lining it up with the end of the top bar and keeping it flush with the sides. Run the 51 drill through the hole in the bar, making a countersink on the top of pedestal, remove, drill the countersink with a No 55 drill for about $\frac{1}{4}$ in. depth, and tap $\frac{1}{8}$ in. or 1/72.

Replace the pedestal and fix with a steel screw. When attaching the inner pedestals put a piece of bar $\frac{1}{2}$ in. wide between inner and outer, as a spacer, and clamp the lot together while running the drill through the hole in the frame; this will ensure correct spacing.



Cover all the joints between frame bars, pedestals, and centre-piece with wet flux, lay the assembly on its back on some small coke in the brazing pan, heat the lot to bright red, and apply a piece of thin soft brass wire or easy-running brazing strip to each joint. If the heat is sufficient the brazing material will melt and penetrate right through the joint. Run a fillet between centre-piece and frame bar at each corner. Let it cool to black, quench in water, clean up, and file off all the screwheads.

The combined pedestal-tie and stay-bar is a 5 in. length of $\frac{1}{4}$ in. $\times$ 3/32 in. mild steel. Drill four No 41 holes at the spacing shown in the underside view, then clamp the piece of strip steel temporarily in place, locate the screwholes through those in the strip, mark the strip so that it can be replaced the same way, drill the marked places on the bottoms of the pedestals with No 48 drill, tap 3/32 in. or 3/48 and attach tie-bars with screws to suit.

Chuck a piece of $1\frac{1}{2}$ in. round bar—bronze or gunmetal for preference, but brass will do if nothing better is available—face the end, centre, drill to $\frac{3}{8}$ in. depth with 23/64 in. drill, turn down $\frac{3}{8}$ in. length to a press fit in the hole in the middle of the centre-piece and part off at a bare $\frac{1}{8}$ in. from the shoulder. Reverse in chuck, gripping by the spigot, face off the disc to 3/32 in. thickness, and put a $\frac{3}{8}$ in. parallel reamer through the hole. Press the spigot into the hole in the centre-piece.

AXLEBOXES AND SPRINGING

The axleboxes may be made from drawn bronze or gunmetal bar of $\frac{3}{4}$ in. $\times$ $\frac{9}{16}$ in. section, or nearest larger, or from castings. If the latter, they will be cast in a stick, with the fancy fronts (representing the lids of the full-sized boxes) cast on.

The sides of either the drawn bar or the cast sticks are milled off in exactly the same way as those described for the engine truck, so repetition is unnecessary. The lengths can be either parted off in the four-jaw, or sawn off, and the ends faced in the chuck to $\frac{3}{8}$ in. length. The boxes should be an easy sliding fit between the pedestals, but not slack.

Drill a $\frac{1}{4}$ in. hole $\frac{7}{16}$ in. deep in the back of each box. If a drilling machine is not available, chuck the boxes truly in the four-jaw and centre and drill with the tailstock in the usual way, as the holes must be perfectly square with the back and sides. It will be noticed that only one flange is shown, and that is on the inside of truck frame; this is to allow the boxes free movement to tilt on an uneven track.

Drill a $\frac{1}{16}$ in. oiling hole in the front

of each box near the top, sloping down to the journal hole. If the fancy fronts are fitted, this can be just below the dummy hinges. Personally I shouldn't bother about the dummy lids, but should just bevel off the edges of the boxes where they project beyond the pedestals.

I have done this with British pattern tender axleboxes, and they look quite all right. However, some folk worry more about a little detail like that than they do about the efficiency of the engine—there is no accounting for tastes!

The arrangement of equalisers and springs is precisely the same as on the engine truck, the equalisers being cut from 16-gauge steel to the dimensions shown in the drawing. Same applies to the hangers, which are attached to the equalisers by $\frac{1}{16}$ in. iron rivets. Dummy cast springs are drilled $\frac{1}{2}$ in. in the hoop to take a spiral spring which bears against the underside of the frame bar when the springs are erected.

The springs are fixed in the inverted position shown between the hangers either by long $\frac{1}{8}$ in. rivets through the bottoms of the hangers and the holes in the ends of the springs, or by bolts made from $\frac{1}{8}$ in. silver steel, screwed and nutted at each end, according to the desire of the builder of the locomotive.

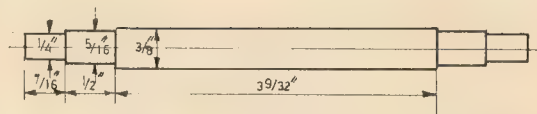
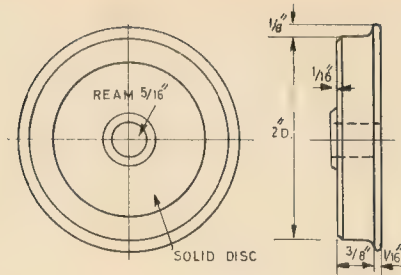
Should anybody wish to fit working leaf springs, proceed exactly as described for the engine truck as the spring sizes are the same for both engine and tender trucks and they are erected in the same way.

WHEELS AND AXLES

The wheels are of the disc pattern, spokeless, and are 2 in. dia. on thread with $\frac{1}{2}$ in. flanges, and the bosses are drilled $\frac{19}{64}$ in. and reamed $\frac{5}{16}$ in. Again, there is no need to repeat the instructions for turning them.

The axles can be turned from $5\frac{1}{2}$ in. lengths of $\frac{3}{8}$ in. round steel (silver

Plan and end elevations of wheel, and details of axle



steel or drill-rod are most durable) which can be held in the three-jaw chuck, and both journal and wheel seat turned at the same setting so that it doesn't matter if the chuck is a wee bit out of truth as the wheel seat must of necessity be true with the journal. Both wheels can be pressed on to each axle right away.

How the trucks are erected

Assembly and erection is very easily done. To assemble a truck, lay the frame upside-down on the bench and take off the tie-bars. Wind up four spiral springs exactly as described for the engine truck. Put one in the hole in the spring hoop, and insert the assembly of spring and equalisers between the pedestals, the ends of the equalisers going over the outsides of the framebars and pedestals, and the spring bearing on the frame bar.

Put an axlebox on each end of the axle and carefully fit the axleboxes to the pedestal jaws. If the boxes are made to instructions, and the jaws are correctly spaced, the boxes should be interchangeable. Note if the boxes bear evenly on the ends of the equalisers, and if O.K. all that remains is to replace the tie-bars and screws.

A rubbing-plate is needed between the bushing in the top of the centre-piece and the bottom of a truck bolster bent up from $1\frac{1}{4}$ in. $\times$ $\frac{1}{8}$ in. steel. This is merely a disc of brass $\frac{3}{32}$ in. thick, $1\frac{1}{4}$ in. dia. with a $\frac{3}{8}$ in. clearing hole in the middle. It may be cut from sheet or parted off from a piece of the same kind of bar used for the bushing.

Put it over the pin in the bolster, put on the truck, and secure it with a steel washer and a nut made from $\frac{3}{8}$ in. hexagon steel. The truck should swivel quite freely on the pin, with about $\frac{1}{32}$ in. clearance between the bottom of bushing, and the retaining washer. To prevent the nut slacking off when the engine runs at a high speed over a rough track (and she will be able to do just that, as you will see) drill a No 50 hole right through nut and screwed end of pin and put a $\frac{1}{16}$ in. split-pin in it. That will do the trick.

Now, if the tender chassis is tried on the track, it should run quite freely. Try it with some weights on the soleplate and note if the springs and equalisers function all right before fitting the body and tank.

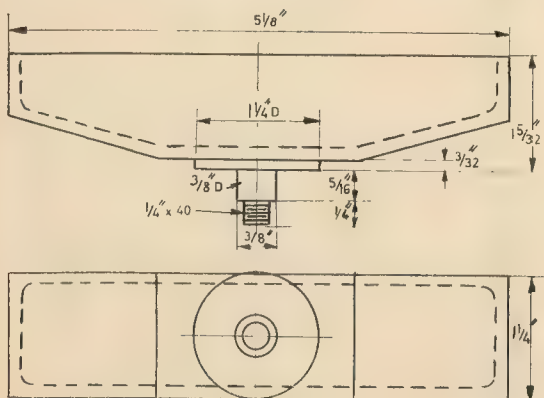
Variations for casting-built trucks

If a small boss is cast on the underside of a cast truck frame, on the opposite side to the bearing face which takes the place of the turned centre flange on the built-up truck, it could be held in the three-jaw and the flange faced off and drilled for the $\frac{3}{8}$ in. pin at the same setting.

Otherwise, the frame would have to be held in the four-jaw for this operation. The axleboxes, equalisers and springs are made and fitted exactly as described for a built-up truck and a similar tie-bar is fitted at the bottom of the cast-on pedestals at each side.

Regarding cast truck bolsters, I have included here a drawing of one

● Continued on page 331



Plan and side elevations of the side truck bolster

A light milling spindle

J. W. E. MESSAGE
describes a useful
and versatile spin-
dle for the lathe

OF ALL lathe accessories, the milling spindle is probably the most versatile, for, coupled with the variety of cutters with which it can be used, it is capable of infinite angles of approach to the work when attached to the vertical slide.

The spindle to be described was made over seven years ago and has become indispensable, considerably increasing the scope of the lathe.

Chief features of the design are the chuck, which carries cutters having shanks $\frac{1}{8}$ in. dia. only, and the front journal which bears simultaneously on a shoulder and a taper to take both thrust and side loads.

The materials required are those usually to hand; the bearing block can be of cast iron, steel or duralumin. Dimensions are not critical but are given for the benefit of readers who possess a vertical slide of no greater width than $3\frac{1}{2}$ in.

BEARING BLOCK

This is held in the four-jaw chuck and machined on both bolting faces, care being taken to keep them parallel by pushing the block hard back against

shows one hole filed into a slot; this was to allow the block to be attached to differing vertical slides.

After marking the centre of the edge of the block where the spindle will run, lightly centre pop it and bolt the block to a suitable angle plate by means of the holes and attach the assembly to the faceplate. Set the rear face of the block parallel to the faceplate by means of callipers, leaving the front edge standing clear for machining.

Tighten the bolts through the block and shift the angle plate until the centre-pop runs true. The offset mass will require a balance weight. Run the lathe in bottom direct speed and machine the front face of the block back to size. The bore for the spindle bushes is machined at this setting by centre drilling and using a succession of drills until the hole is $\frac{1}{32}$ in. undersize.

At this point a boring tool is brought into use as shown in photograph A until the hole is about 0.002 in. undersize. Finish the bore with a reamer or a D-bit made of silver steel, but if these are not available a fine feed and plenty of cutting oil will enable the boring tool

to "size" the hole, leaving a good finish.

The remaining edges of the block are machined by presenting each in turn to the tool, using a tri-square against a previously machined edge and the faceplate for correct setting. After removing the block from the angle plate drill the oilway, which must clear the bolt hole yet arrive in the centre of the bore.

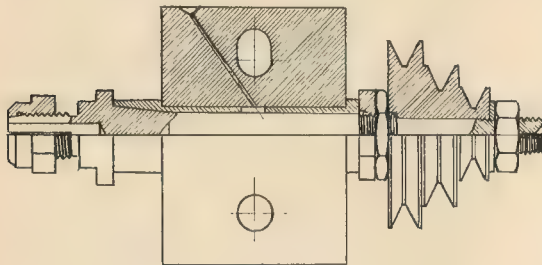
Mark the slope of the hole on one face of the block and after centre drilling the start of the hole, clamp the block in a machine vice with the scribed line vertical. Proceed with the drilling cautiously, running at high speed and using plenty of cutting oil, clearing the chips frequently.

The final hole will swallow the fluted length of a standard $\frac{1}{8}$ in. dia. drill, but if the drill should break there are still three alternative sites available for fresh drillings! It would be an advantage to fit a spring-lid oiler to the finished hole to keep out swarf when using the spindle.

SPINDLE BUSHES

These are straightforward turning jobs in bronze, machined all over at one setting in the three-jaw chuck and parted off or turned from short lengths which are first bored and reamed to size and finished externally on a pin mandrel. Cast phosphor bronze stick is preferable to drawn rod for the bushes as it has not the latter's tendency to bind on the drill or reamer. Leave the outside diameter of the bushes 0.0015 in. oversize for a press fit in the bearing block.

When boring the taper in the front bush with the top slide set over 5 deg., remember that the cutting point of the boring tool should be set correctly at centre height and not a little above,

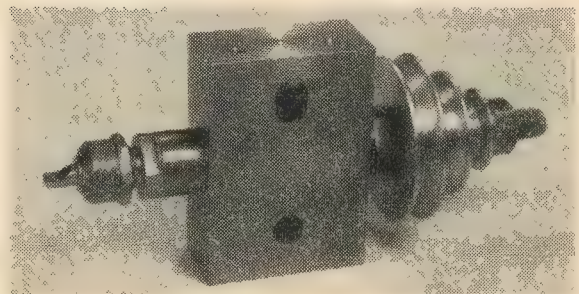


Left: Sectional view through the completed set-up

the jaw steps when tightening the chuck. Ensure that the tool is set at centre height as no suggestion of a "pip" can be allowed on the bolting faces or this will cause indentations on the surface to which it is clamped.

A good finish can be obtained with a round-nose tool clamped at right angles to the face of the block, and it should not be necessary to finish the face by scraping. After removal from the chuck, drill the holes for the attachment bolts as they are necessary for the next operation. The drawing

Right: Assembled milling spindle with D-bit cutter in the chuck

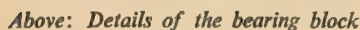




Set the topslide over 5 deg. and rough-out the taper to within $\frac{1}{16}$ in. oversize. Change over to a narrow roundnose tool with top rake for finishing. It will need a sturdy shank as it must protrude well from the tool-post and so enable the topslide handle to be accessible.

Frequent recourse must be made

Right: (a) Boring milling spindle body for bushes. This set-up is also used for machining edges of block. (b) Screw-cutting spindle nose. (c) Taper turning front journal of spindle while held on pin mandrel and topslide centre. (d) Slitting spindle nose with work clamped under toolpost. (e) First stage in turning three step pulley. (f) Grooving three-step pulley using a V-point tool



A light milling spindle . . .

to the marking blue test and any minute error in the final stage can be rectified by using a slip stone in the manner previously mentioned.

When all is satisfactory, screwcut the locknut and pulley nut threads with the gear train set up previously. Do not "size" them with dies until the nuts have been made. The spanner flats on the spindle collar can be filed or milled to choice.

CHUCK NUT

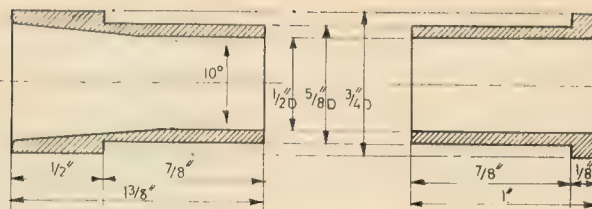
This is made from mild steel hexagon bar 23/32 in. A.F. Chuck in the three-jaw, face, centre drill and open out to $\frac{7}{16}$ in. dia. through the full length of the nut, plus parting off allowance. With a boring tool open out the hole to $\frac{1}{2}$ in. $\times$ 26 t.p.i. tapping size for a depth of $\frac{3}{8}$ in. and undercut the end where the thread will finish with a narrow-tipped boring tool.

Set the topslide over 10 deg. and taper bore the far end of the nut after threading the hole $\frac{1}{2}$ in. $\times$ 26 t.p.i. by using the appropriate taps held in the tailstock chuck. Apply marking blue to the nose of the spindle and screw it into the nut (while still in the chuck) to obtain test markings of the taper.

This is the time to "size" and finish the thread on the spindle nose with a die until a comfortable fit is achieved. This operation can be carried out in the vice with the spindle gripped in the split jaws, or preferably in the split holder used in a later operation.

When the taper is satisfactory, machine the outside of the nut and part off. It is recommended that the nut be finally case-hardened with the object of counteracting wear on the taper and on the spanner flats.

The next operation is to split the spindle nose and this is best carried out with the work held in a split clamp in the toolpost which is fed in to a slitting saw held on a mandrel in the chuck as shown in the photograph D. As the slitting should be carried out with the spindle set at



Sectional view of the bronze bushes

centre height, the material for the split clamp should be gripped in the toolpost and drilled from the chuck to $\frac{1}{2}$ in. dia. The longitudinal cut is made afterwards with a hacksaw.

Set up the spindle in the clamp parallel to the cross-slide and run the saw at bottom direct speed, using plenty of cutting oil. The second slit is cut at right angles to the first and the final job is to remove the burrs left by the saw. The spindle bushes can now be pressed into the block with a suitable draw bolt and protective washers against the bush flanges. Pass a $\frac{1}{2}$ in. dia. reamer through the bushes to correct any distortion from the pressing.

SPINDLE LOCKNUTS

These are turned from mild steel hexagon bar 23/32 in. A.F. After drilling and tapping them in the lathe, part off with a little to spare and face each nut back to size while held on a short screwed mandrel in the three-jaw chuck. This is essential to obtain smooth running of the spindle.

The pulley nut is made in the same manner but does not require the secondary facing. The wearing qualities of the spindle locknuts will be improved by case hardening.

The three-step pulley illustrated E and F was turned from aluminium alloy bar of 2 in. diameter, the steps being 2 in., $1\frac{1}{2}$ in. and 1 in. diameter respectively, each being $\frac{3}{8}$ in. wide. There is a wide choice of materials suitable for pulleys with hardwood probably the cheapest.

Chuck sufficient length of material

for the pulley in the three-jaw, face, drill and bore for the spindle. Mount the work on a mandrel held in the chuck or between centres and the whole job can be machined at one setting.

Use a knife tool to cut the three steps and a V-point tool to machine the belt grooves, cutting with the side of the tool to widen them as shown in the photograph, F. A standard screw-cutting tool of 55 deg. included angle is suitable for the grooves.

GENERAL

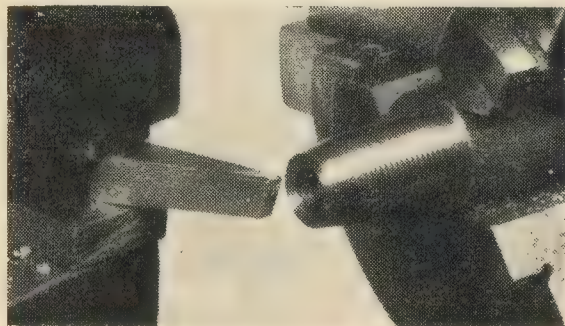
The milling spindle has always been mounted on the vertical slide when in use, to obtain the benefit of three-dimensional movement and the leadscrews can be used for measuring required movements. Small drills and end-mills are driven quite happily at 5,000 r.p.m., but when side milling and sawing mild steel the spindle revs are reduced by fitting a 6 in. dia. wood pulley in place of the three-step.

Since the chuck will hold shanks of $\frac{1}{4}$ in. dia. only, small drills can be sweated into $\frac{1}{4}$ in. o.d. sleeves. The usual practice applies of centre-drilling before drilling, and centre-drills with $\frac{1}{4}$ in. dia. bodies are obtainable. Commercial cutters will require mounting on suitable mandrels which have been turned at one setting or between centres, with the shanks turned down to fit the chuck.

Silver-steel cutters of D-bit form have given more satisfactory results than commercial end-mills. When in use, the spindle is driven by a $\frac{1}{6}$ h.p. motor and motors of $\frac{1}{25}$ h.p. and $\frac{1}{60}$ h.p. have been successfully used, with correspondingly lighter cuts on the work. The driving medium has at all times been $\frac{1}{4}$ in. dia. plastic belt, which obviates the need of overhead drives, belt tensioners, etc.

Practically all work calling for the use of the milling spindle will require some form of indexing device for the work and as the subject has been dealt with in previous issues and also the M.E. handbooks *Milling in the lathe*, and *Lathe accessories*, it is not proposed to discuss it here. ■

MILLING IN THE LATHE, 6s. 3d., post paid; LATHE ACCESSORIES, 3s. 9d., post paid. Both are obtainable from Percival Marshall Ltd.



Taper turning the spindle nose to receive chuck body

Mechanical drawing aids

STANDARD ANGULAR set-squares are used in conjunction with the main pantograph set-square for depicting both knurling and section lining. Knurling is usually drawn at an angle of 30 deg. to represent the appearance left by the corresponding machining operation, but for section lining a 45 deg. angle is normally employed.

A set-square of modern make has a central portion cut out with its sides formed parallel with the edges of the square. This feature provides a means of controlling the movement of the square along the arm of the pantograph square to ensure that there is equal spacing of the series of parallel lines drawn to denote knurling or section lining. To serve as a setting gauge a small hollow cylinder is machined from brass, duralumin or plastic material.

As shown in Fig. 12 this gauge is placed in contact with right-hand and lower edges of the cut-out in the square and at the same time the base of the square rests on the horizontal arm of the main square.

When representing knurling the first diagonal line is drawn at an angle of 30 deg. with the gauge held firmly in place with the finger; for drawing the second oblique line the square is moved to the right until its travel is checked by the gauge. Next the gauge is moved to the right until it butts against the sides of the cut-out and the square is again slid to the right for drawing the third line of the series.

These movements are repeated until all the lines have been filled in and the square is then turned over for drawing the diagonal cross-lines in a similar manner. By adopting this method a series of parallel lines can be quickly drawn with the assurance that the individual lines will be accurately and equally spaced.

Although the lines indicating knurling are sometimes drawn more closely together towards the areas in shadow, spacing the lines at equal intervals gives a good appearance especially when these lines are thickened to represent shading. One of the conventional ways of shading knurling in order to throw the pattern up into

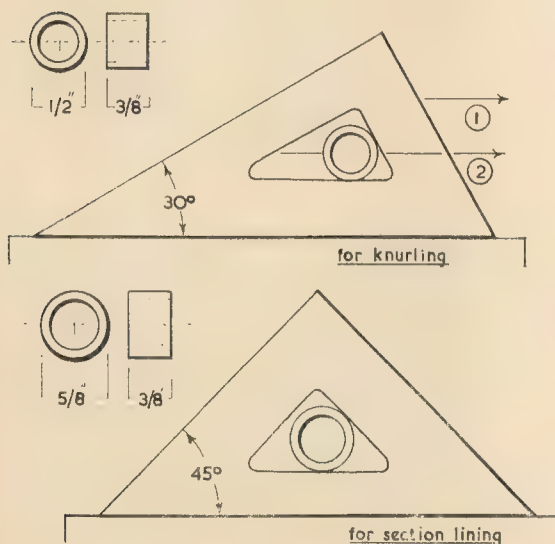
relief is that illustrated in Fig. 13, where the individual diamonds are picked out with crescent-shaped block shading where they are in shadow.

Section lining, at an angle of 45 deg., is drawn to pick out the surface of a component where it has been cut through, usually on the centre line, to show the internal construction. The above method is again used for spacing the lines at equal intervals.

The actual spacing of the lines in both the instances referred to depends on the diameter of the spacing gauge in relation to the size of the cut-out area in the set-square, but with the squares in use it was found that gauges ranging in diameter from $\frac{1}{2}$ in. to $\frac{3}{8}$ in., by increments of $\frac{1}{32}$ in., gave all the variations of line-spacing needed.

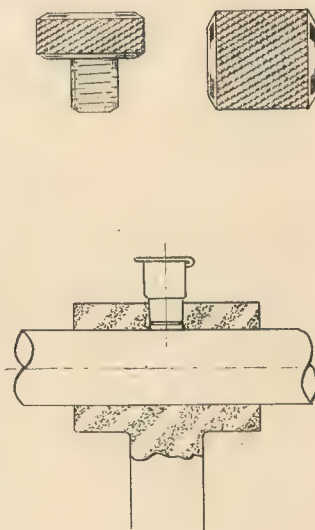
An alternative method of indicating that a part is shown in section is illustrated in Fig. 14. The dotted areas are filled in with the drawing pen and the finished appearance is perhaps rather less drab than that given by the customary drawing convention.

There are several conventional

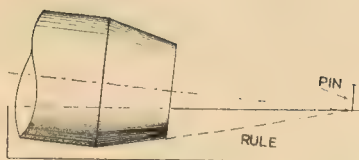


Right, Fig. 13: Examples of knurling finished with shading effects

Left, Fig. 12: Locating set-squares for drawing knurling and spacing section lining



Right, Fig. 14: An alternative method of shading parts drawn in section



Above, Fig. 15: A method of drawing shading lines on a coned surface
Right, Fig. 16: Some conventions used in shading and also in back-lining

methods used in mechanical drawing for shading cylindrical parts, including drawing a series of fine or thick lines to give the appearance of areas in shadow or indicating these areas by means of heavily-inked block shading.

The only difficulty likely to arise here is when the shading has to be continued on to a coned surface as in the example illustrated in Fig. 15, for to give the correct appearance the shade lines must conform to the shape of the truncated cone set out in the drawing. To locate these lines the two sides of the cone are projected to indicate the apex of the figure and all the shade lines will then converge towards this point.

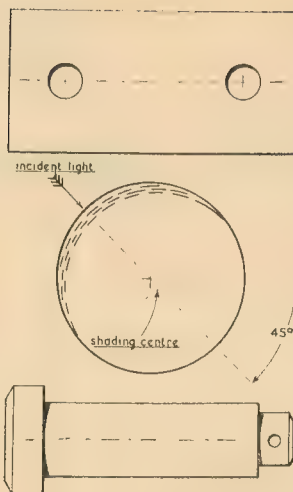
Drawing will be facilitated if an ordinary sewing pin is stuck in the drawing board at the apex of the cone to serve as a guide against which the ruler is kept in contact as it is moved step-by-step for inking-in the series of shade lines.

Back-lining technique

Another technique used for enhancing the appearance of a drawing is that illustrated in Fig. 16 and known as back-lining. Here the right-hand edge and lower side of a plain figure are drawn more thickly than the rest of the outline. For this work it may be found best to keep the ribs of the drawing pen at a fixed setting and to thicken the lines by making a second passage of the pen after the ruler has been offset for a short distance.

This obviates having to keep altering the adjustment of the pen and also ensures that lines of uniform thickness can be drawn when needed. As a further embellishment the mouths of bores and drill holes can be given a more realistic appearance by adding the simple type of shading illustrated in Fig. 16 where the centre drawing shows the method used.

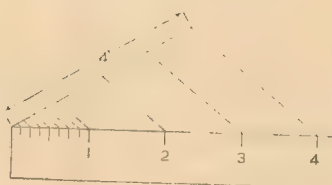
Here one or more arcs of circles are drawn from a centre slightly eccentric to the main centre point. The new centre lies on a line drawn at an angle of 45 deg. to the vertical and is located below the original centre so that the shading corresponds



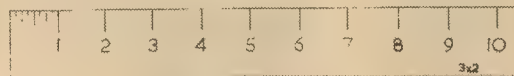
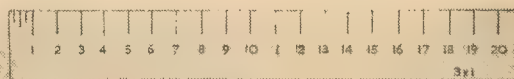
with the direction in which the incident light falls on the object.

Where heavy shading is employed it may be found necessary to complete the inking-in either with a pen or by altering the radius to which the compass is set; in any case it is important to ensure that the shading merges evenly with the circular outline.

The lower drawing in Fig. 16 depicts a standard clevis pin where, in addition to back-lining, shading has been introduced to give the undercut shoulders a more realistic appearance. For this purpose an arc of a circle is drawn with the compass from a centre located on the centre line of the part and the shaded area is afterwards blocked in.



Above, Fig. 18: Geometrical construction of a drawing scale



Right, Fig. 17: Set of scales drawn on card-board

SCALES

There is no great difficulty in calculating dimensions when making drawings, say, half-size or twice the full size, for direct readings can be obtained from an ordinary rule; but when a scale having a ratio of one third or three times the full size is adopted a standard rule graduated in 1/32 in. will not serve for transposing even inches when expressed as whole numbers.

Where suitable boxwood or ivory scales are not included in the drawing equipment, their counterparts can be readily made by setting out the required conversion scale on stiff card or plastic material in indian ink.

For marking-out the scales the recognised geometrical method is used and for the benefit of those who have forgotten the solution of the problem learnt in their school days the construction is set out in Fig. 18.

In the example given a rectangle is first drawn long enough to contain the whole length of the scale required. As the finished scale is to be one and half times full size, a scale representing 4 in. will be 6 in. in length. From the left-hand end of the rectangle a line equal in length to the corresponding number of inches required on the scale is drawn at an acute angle.

The free end of the latter line is next connected to the end graduation already marked on the scale to denote a length of 4 in.

To complete the scale a series of lines is drawn parallel with the previous line from the remaining inch and fractional-inch points on the 4 in. oblique line to indicate the location of the scale graduations.

If as shown in the photograph a series of scales is made on good quality card much time may be saved and possibly errors avoided when making drawings involving the ratio 3 to 1, or other odd numbers, as well as fractional multiples and sub-multiples.

● To be concluded.

Do not forget the query coupon
on the last page of this issue

READERS' QUERIES

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20, Noel Street, London, W.1.

Welding problem

I have a small welding transformer which is quite useful for normal work, but I wish to weld some sheet metal—about 20 s.w.g.—and I understand this is only possible by a carbon arc process on d.c.

Would it be possible to connect a metal rectifier in circuit to obtain direct current? If so, what would a suitable rectifier cost? I understand the usual current for this purpose is about 20 amps at 60 v.—R.P., East Grinstead, Sussex.

▲ For welding thin sheet metals you do not have to provide a source of direct current, either current is suitable for welding sheet metals. The current value you give appears to be correct. Carbon electrodes are seldom used in normal welding except where it is required to have an intense local heat, this class of heat being suitable for such work as brazing or silver soldering and where the welding rod contributes any of the metal being welded.

Using carbon rod on the lines you have in mind would be more likely to melt your metal rather than weld it together: if you examine this you will see that besides heating the place of the weld you also have to provide sufficient heat to melt the welding rod being used—whereas in normal welding most of the heat is provided by the rod itself and the metal under the action of the arc formed.

A rectifier is unnecessary and would be a costly item for the current output needed.

Second-hand lathe

I have just bought a second-hand 1952 3½ in. Grayson lathe minus the countershaft and motor.

I would like to know the maximum speed it will achieve and, if I make my own countershaft, what size pulley should I use on my 1/3 h.p. motor and on my countershaft? In addition, are there any accessories available for this lathe? If so, could you let me know what they comprise?—W.G.S., Guildford, Surrey.

▲ The speed generally recommended for lathes of this type is a mean speed, that is on the centre step of the pulley, of approximately 500 r.p.m.—and this is the speed at which the countershaft should be run. It is possible to run

at higher speeds than this, but the bearing lubrication would have to be carefully watched and, generally speaking, the most useful range of direct and backgear speeds are obtained with the countershaft speed specified.

To obtain this speed from a motor running at 1,425 to 1,450 r.p.m., which is the standard speed for most fractional h.p. motors, a pulley of 2½ in. dia. should be used on the motor and 7 in. on the countershaft. One-eighth h.p. is a little on the low side for a lathe of this size though it is possible to do a good deal of light or moderately heavy work with this power.

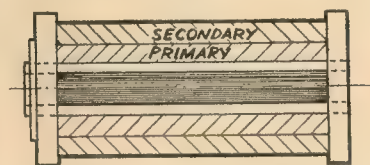
It is not known whether accessories are specifically available for this lathe, but as it is generally similar to a number of other lathes of the same type and size practically all the accessories advertised for the Myford lathes would be suitable.

Induction coil

Could you give me the windings, gauge of wire and number of turns for a medical induction coil?—A.W.C., Rochdale, Lancs.

▲ Assuming that the dimensions are approximately the same as shown in your sketch, the primary windings should have five layers of No 22-gauge wire and the secondary about 20 layers of No 36-gauge wire.

In order to avoid the risk of an insulation breakdown in the secondary,



it is advisable to wind this in layers with interleaving of thin paper between each layer. In medical coils it is advisable to provide some means of regulating the strength of the secondary current. There are two methods of doing this; first, by winding the secondary separately on a bakelite or ebonite tube which will slip over the primary winding and can be adjusted to vary the efficiency of coupling and, secondly, to wind the complete primary and secondary on a similar tube and to interpose a thin metal tube which can be pushed in between the core and

primary to isolate or shade the magnetic flux.

The latter is the more common method, but the former has the advantage that it does not in any way affect the action of the vibrating contact breaker whatever strength of current is being applied.

Cutting T-slots

Could you advise me of methods for cutting T-slots and V-slides in the lathe? (I have no shaping machine) I have consulted my various M.E. handbooks without success. The smallest T-slot cutter available is much too large for model T-slots as described by Martin Cleeve, and Woodruff cutters are now listed with a protruding centre pip and without side teeth or clearance. Would a fly cutting operation be possible for T-slots? I can see it may be possible for V-slides.

I hope to use these operations in making small machine vices and drilling tables, but am rather concerned about the use of milling cutters on cast iron as they appear to lose edge very rapidly and are extremely difficult to sharpen accurately without complex machines.—L.N.J., Leeds.

▲ Unless two or three cutters of graded sizes are used you must take out a comparatively large amount of metal in one cut. This is the most difficult part of the operation. It is, of course, possible to cut a parallel slot to the width of the slot at the top end, with either an end mill or a side milling cutter, and then use cutters of dovetail or T-shape to finish the slot.

No information on any commercially-made cutters in a suitable size is available, but it would be possible to make the cutters in silver steel, which could be used in the way described. The Woodruff type of cutter is not suitable—at least not without alteration.

It is not absolutely necessary to make T-slot cutters with side-cutting teeth, provided that the sides are undercut so that they have clearance.

As to cutters losing their edge when used on cast iron; if they are properly tempered and run at the correct speed they should not wear unduly rapidly, unless the iron is of bad quality with inclusion of sand or grit. It is not considered that a fly-cutting operation would be very suitable for T-slots.

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

RAILWAY COUPLINGS

SIR,—Vulcan is quite right about the coupling question on British Railways [Smoke Rings, January 31]. Many here will remember that a serious accident to the up "Aberdonian" was only averted some three years ago by the fact that—like most ex-L.N.E. main line stock—the coaches were fitted with buck-eye couplers and these held when some three coaches "teetered" on a 40 ft drop at the north end of the North Queensferry Tunnel after the train had slipped back and been caught by a badly sited catch point.

But on this matter of couplings the railways of Britain have always been laggard, as witness that they still build new freight stock with loose-link couplings—little better than those used at the Northumberland collieries when George Stephenson was a boy.

Why is it that apart from London's Underground, so rightly famed for its safety record, all progress in safety measures on our railways is almost always preceded by oblations of human blood?

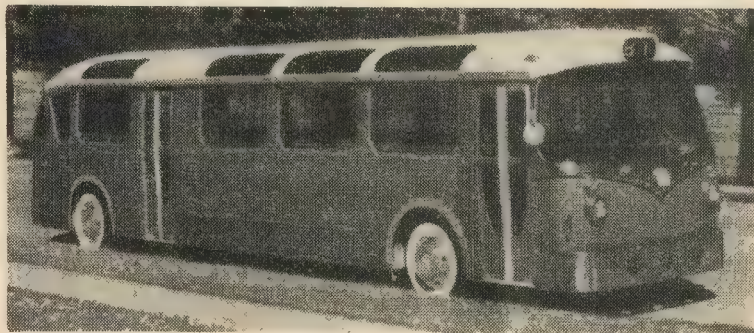
Edinburgh, 3. W. LOCH KIDSTON.

BUS OF THE FUTURE

SIR,—I remember your article about the bus of the future [8 November 1956] and I thought bus enthusiasts in Britain might be interested in what some people here think the bus of the future should look like.

Westbury, J. C. MADSEN.
Rhode Island.

Modern style American bus built by Mack. Large window areas mean good visibility for driver and passengers. It is air conditioned



MODEL ENGINEER

PROPORTION PLEASE

SIR,—Some time ago the point of over-detailed and technically-padded articles was mentioned on these pages which raises the question of how much fine detail is justified in any write-up.

I have suffered both ways. I have come up against the writer, who has got beautifully vague just when he should not, but how I have suffered from the gentleman who seems unable to get on with his topic on account of the side-tracking data he is always bringing in.

It is all a matter of proportion. Details are wanted of course, but when these *markedly* exceed the purpose of the article they become redundant and slightly irritating to the intelligent reader. This line of thought leads to the question of the unbalanced critic, also mentioned on these pages.

Such gentlemen are past masters in making additional information sound like corrections, and will scream "inaccurate" when a broader term is used to help less enlightened readers or a round figure quoted in place of some long drawn out and totally meaningless decimal.

I have always mistrusted the six-decimal-point man as being fundamentally impractical. I have in mind a fellow student of my university days who would never use a survey chain without testing for link wear and working out a coefficient of correction for all measurements he made. The same student thought

nothing of carrying his chain over bushes and letting it lie in hollows which brought about inaccuracies that made his coefficient of correction utterly silly. Yet of this he seemed oblivious.

The whole matter again is one of balance. Glaring errors in print need correcting; but fault-finding beyond a point is in itself a fault. Accuracy carried too far can become actually inaccurate.

There are two other things I dislike about the man who criticises from the six-decimal-point stance. For some reason he usually puts over his criticism in the most offensive manner possible. Also if an article containing, say, 50 statements, five can be queried he talks as though the material were rotten to the core. The fact that there are 45 perfectly sound statements is studiously ignored by him.

It is all, as I say, a matter of proportion. Balance and good engineering are synonymous terms. Balance is a fundamental requirement in every machine and structure, also in every criticism or written article. Extremism is essentially impractical and the resort of the person who distrusts himself—the escapism of the man who lacks the ability to come to poised conclusions.

Wirral.

H. A. ROBINSON.

MORE, PLEASE

SIR,—May I refer to that excellent series of articles "Locomotives I Have Known," by J. N. Maskelyne appearing in MODEL ENGINEER? These articles certainly fill a long-felt want in providing authentic information for the model making fraternity.

The article on Brighton Terriers was very good. Could our friend be prevailed upon to follow up last week's article by one on the E class tanks of the L.B. and S.C. Railway? Brockley, S.E.4

H. J. DAY.

BACK TO COAL?

SIR,—May I reply to the two letters [Postbag, January 24] on the subject of steam locomotives, fuel, and c.i. engines?

Since Mr Clauson admits the steam-turbo electric, I have no argument with him. From his prior letter I

inferred he ruled out the steam locomotive, or coal-fired gas-turbine completely. The reciprocating steam locomotive of Stephenson type, as we know it today, is washed up, but the turbo-electric or high-speed geared locomotive is not.

My objection to oil fuel is that it has to be imported, and its supply can be cut off by international events. Mr Clauson notes several fuels, but these really boil down to three possibilities—coal, oil and coke.

While long distance electrification will, where traffic density warrants it, prove in the long run the most suitable form of power, there are many cases—the Scottish lines are an instance—where other motive power will be required.

I understand that the problem of "fly-ash" in connection with a solid-fuel gas-turbine locomotive has in a large measure been overcome and that such a locomotive is under construction, by I believe Baldwins. Reverting to steam-turbo electrics, it may be noted that the Norfolk and Western *Jawn Henry* has developed a tractive effort of over 224,000 pounds, a figure I believe never exceeded by any locomotive in a single unit, steam, diesel, or electric.

I should be glad, however, if K. N. Harris will inform me on the following: (a) when and where have I claimed to be an authority on any subject? (b) whose grandmother have I instructed in the art of sucking eggs?

As I only deal with facts as they are, and the views of those who know, perhaps, as he himself expressed it some time ago, "those in a position to know with regard to the diesel", I may quote two views of those who really do know: both are American and I think he will agree the Americans have had far more experience in connection with the diesel than ourselves.

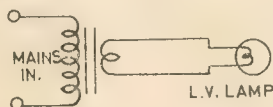
(1) General Electric. "The development and use of the gas turbine which today makes use of oil, may tomorrow use coal."

(2) John W. Barringer, president of P. and Lake Erie Road. He has also pulled half-a-dozen other roads out of bankruptcy. "The diesel is fine for today and the near future, but it runs out of breath at high speeds, and I warn against a sentimental attachment to it. The stationary steam turbine generating units would allow the roads to get back on a coal standard."

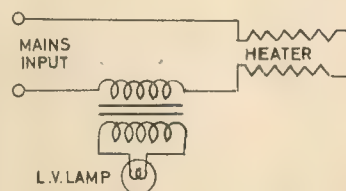
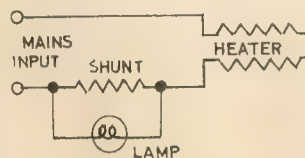
The reason for both these statements is the rising price of oil in the U.S.A. John W. Barringer has written a book *Super Railroads of a Dynamic American Economy*. Publisher is Boorman of 30 Church Street, New York. Bishop's Stortford. G. WOODCOCK.

INDICATOR LAMPS

SIR,—Regarding your reply to the query about indicator lamps sent in by R.A., Hammersmith [Readers' Queries, January 31]; to use a lamp of different current consumption than the apparatus can be done very simply (as on domestic irons) by connecting a low-voltage low-current lamp in parallel with a shunt resistance, the whole being in series with the appliance element, as shown in the sketch.



The resistance of the shunt must of course be calculated to drop approximately the voltage of the lamp across it, taking into consideration the current taken by the lamp. Noting also that your correspondent is on a.c. mains, the better solution would be to use transformers, in which case any lamp he desires can be employed either in conjunction with appliances or as separate indicators.



Small transformers can usually be supplied by many of the advertisers in MODEL ENGINEER. Weymouth, Dorset. W. FORD.

SIR,—Mr "R.A." of Hammersmith, W.6 [Readers' Queries, January 31] states he has been using a 15 watt lamp as an indicator and he says: "apparently a lower voltage bulb for the mains is not made." He may be interested to know that there is a bulb made by Ekco rated at 230/250 v.,

0.5 watt and when in use it barely gets warm.

It is about 2 in. long overall $\times$ 1 1/2 in. dia. It has ordinary bayonet fixing and inside there is a metal ring connected to one contact and a small grid to the other. It is apparently filled with neon gas as it glows a pinky red when switched on. I have had one in use for the past year.

I am glad to see MODEL ENGINEER is gradually getting back to the old standard, i.e., catering for the model engineer and not the weekly journal type of reader. I think Postbag is a splendid reflection on your efforts the world over.

Alton, Hants. H. J. GATES.

SIR,—With reference to the query by R.A. regarding indicator lamps for domestic irons, I would like to point out that series-connected lamps are never used owing to danger in the event of a lamp failure.

The method adopted is to include in the main element circuit a small, heavy-gauge resistance, the heating of which is negligible and across which is shunted a 2.5 v. or 3.5 v. standard torch bulb.

In the case of, say, a 240 v., 500 w. element, the current is 2.08 amps. and the pilot resistance would be 1.2 ohms to drop 2.5 v. across it to feed the pilot lamp.

The lamp/resistance combination should be in the neutral side of the circuit, and therefore, is at earth, or near-earth potential. In the event of a pilot lamp failure no breaking of the main element circuit can take place and no dangerous potential can develop across the pilot lamp contacts.

Yeovil, Som.

ROBERT L. BELL.

NOTHING TO SPOUT ABOUT ?

SIR,—On the subject of waterspouts [Postbag, 31 January] your correspondent A.R.J. admirably puts the matter in a nutshell and the outstanding point to note is that waterspouts form and grow downwards out of the cloudbase and not, as is often erroneously believed, upwards out of the sea in the form of an agglomerate column of water.

In contrast to A.R.J.'s letter it is difficult to understand how, in a periodical of serious pretensions and title, the letter which follows it came to be selected for publication.

In it such superlatives as "tremendous proportions" and "terrific velocity" are merely the vague jargon that is typical of pseudoscience and are no substitute for plain coherent statement based on established scientific principles and demonstrable fact.

After a completely inconclusive

MODEL ENGINEER

POSTBAG . . .

attempt to explain something which does not happen in any case, the letter ends with the refutation of an established physical law.

A "terrific velocity" becomes "this force" in the sentence which follows and this force is "whirling in a diameter." A velocity that is a force and a force that whirls is certainly a revolution (no joke intended) in the science of dynamics.

In this confusion of terms we are told that "it can be understood how a column of water far beyond the normal 34 ft in height can be supported." Frankly, I for one do not understand and I must claim to be not completely unintelligent.

Perhaps Charles E. Hooker will expound further his new brand of physics.
London, S.W.7. B. W. STEHELIN.

PLOUGHING ENGINES

SIR,—I am trying to obtain pictures of steam ploughing engines (cable system) as pioneered by Fowlers of Leeds. I have been in touch with Mr A. Pepper of Fowlers but he could only let me have photographs of the engines which they are now selling.

What I really want are photographs of Aveling and Porter cable ploughing engines, also pictures of a balance plough, cultivator and perhaps a caravan although this is not important. I would like if possible to get details of size and measurements so that I could make live steam models of a suitable size, like those made by Mr Palmer of Southampton.
Maidstone. R. SIMONS.

SLUGGED RELAYS

SIR,—With reference to J.G.P.'s query [13 September, 1956] and the letter from James J. Brown [Postbag, January 3], I would like to point out an error in the theory of slugged relay operation.

A relay with a copper slug at the armature end will be slow to operate and quick to release; a copper slug at the frame end of the relay will be quick to operate and slow to release. If the relay has to be slow to operate and release, then there must be a copper sleeve the full length of the relay core. The maximum time lags obtained with these arrangements are of the order of 0.25 sec.

It is quite in order for relay contacts to carry loads of approximately 10 amps. as long as the contacts are suitable to carry the designed load. References for the above are from *Newnes Electrical Engineers Reference*

Book, Sixth Edition, section 22, page 34.

I would like to say thank you to your staff and writers for producing a magazine week after week full of interesting subjects.

Northumberland. R. A. J. HOWARD.

WRITING IT UP

SIR,—Most readers of MODEL ENGINEER are aware that you accept articles and pictures suitable for publication.

Vulcan [Smoke Rings, January 31] reminds us of this and I feel sure he is right when he refers to the difficulty of persuading chaps to write of their experiences.

"Old boys" with 40 or 50 years spent in constructing and running little machines have had triumph and disappointments, amusing situations, and distressing moments, but many will not spare the time to write and others feel their ability as scribes will fall short of the requirements needed.

Why not send a reporter and photographer to interview some of those who would be willing to talk? Abergavenny, EDGAR POWELL.
Mon.

While we do what we can to contact possible sources of information we have neither the unlimited staff nor inexhaustible facilities to meet all requirements.—EDITOR.

FINELY BALANCED

SIR,—First of all I would like to say how very pleased I am to have additional marine articles in MODEL ENGINEER. In my opinion the magazine has reached a very fine state of balance between the wide interests it has to cater for. I have been reading the MODEL ENGINEER now for a great many years but I am sure that it has never been better.

I think one of the important facts in connection with your success is due to your contributors being experts in their own particular line, and for that reason I always read everything even if it is of no immediate interest. I wish you had more advertisement pages but I dare say you do as well!

I have recently had a brick-built workshop erected. I like to have plenty of electrical points, but to take the cable round the walls in an ordinary way is a slow process, with clips to be fitted every six inches or so.

I fitted a wood batten round the workshop, about 5 ft above floor level. The batten was $\frac{7}{8}$ in. $\times$ $1\frac{1}{2}$ in., the $\frac{7}{8}$ in. edge being to the wall. On the front edge I screwed a 2 in. $\times$ $\frac{3}{8}$ in. wood strip which forms a trough with plenty of room for half-a-dozen cables to be taken round the workshop. The cable can leave the trough at any point where a switch

or piece of apparatus needs wiring in.

It is a very simple matter to make alterations or additions to the wiring at any time, and the scheme also lends itself to the form of wiring known as a "ring main."

Now quite obviously the front of the trough makes an ideal tool rack, although it is as well to keep screws or nails towards the bottom edge well clear of the wiring.

Leicester. R. S. FARMER.

The wiring should, of course, be in conduit or lead-covered cable.—Ep.

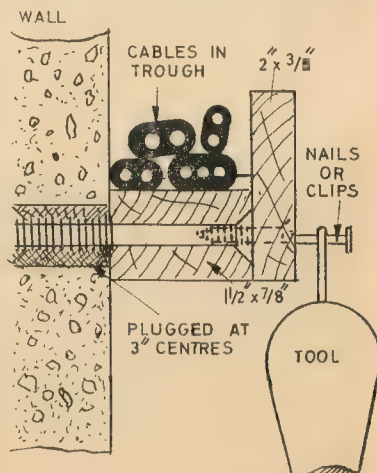
SIR,—Until December of last year I had been a regular reader of *Ships and Ship Models*, then came the news that the book was to be incorporated into MODEL ENGINEER and I am sure that I was not alone in feeling that the proposed joint magazine would be a failure—from the ship modellers' point of view.

The first week of January tended to prove me wrong but not subsequent issues. It would appear that the ship modelling enthusiast is not welcome. If by any chance there is some spare space, after devoting as much as you can to railway trains, steam-engines and derelict tractors, some small article is devoted to our interest—and even then it seems begrudged.

I find this attitude of the publishers strange in view of the tremendously high proportion of ship models at the annual M.E. Exhibition.
Reading. MICHAEL R. SKINNER.

The letters printed here are typical of a number we have received. Some readers like marine articles in MODEL ENGINEER and think the balance is right. Others would like more ship modelling. We shall do our best to find the right balance and please the majority of readers.—EDITOR.

Mr Farmer's suggestion for installing electrical wiring in a workshop



OVER OILING

SIR,—With all due respect to the opinions of Vulcan, [Smoke Rings, January 3] I have found by experience that cutting down the oil supply to the bare minimum in any kind of engine or running mechanism is very dubious economy.

The slogan "oil is cheaper than engines" has been found sound by many motorists, and provided always that care is taken to select the right oil for the particular purpose, any possible harm done by over-oiling is negligible compared to that which will certainly be caused by oil starvation. It should be remembered that in addition to actual lubrication, oil is called upon to serve also as a heat conducting medium and a corrosion inhibitor.

The latter property is more important than is often realised. Three or four years ago I was called upon to examine a batch of cyclemotor engines which had failed in service; they had been working on the manufacturers' recommended petrol-oil mixture of 32 to 1 and in at least 75 per cent. of them traces of rust were

visible on ball-races and other working parts. In a 125 c.c. engine which I run regularly, I stick to what is now regarded as unnecessary concentration—16 to 1—and I have never had the least trouble traceable to excessive oil—touch wood!

In the early days of two-strokes one had to be careful with oil, mainly because sparking plugs were very choosy and a plug which would stand up to oil would not stand up to heat, and *vice versa*. Nowadays plugs have much more tolerance and the type recommended by the engine makers can generally be relied upon to give good results.

Modern engines run much cooler than they did, thanks to good design; and it may be observed that troubles such as sticking of piston rings and heavy carbon deposit are usually caused by poor quality oil, in conjunction with the overheating which results—not to over-oiling, as such.

No doubt with the progress of lubrication research, oils will continue to improve, so that less quantity will go further, and there are also great possibilities in entirely new lubricants such as molybdenum disulphide, not

to mention new bearing materials with self-lubricating properties. But until these are fully established, I advise engine users who are not looking for trouble, to play safe by using good and appropriate oil in adequate but not excessive quantity.

Perhaps I should add that I do *not* possess shares in any lubricating oil producing or selling organisation! London, W.1. EDGAR T. WESTBURY.

DOGMATISM

SIR,—In the 1870s there was an American bishop who was visiting the principal of a college with which he (the bishop) was connected. The principal remarked that in 50 years time men would have learnt to fly. Whereupon he was rebuked by the bishop, who replied: "Flight is reserved for angels and you have been guilty of blasphemy."

The bishop was the father of Orville and Wilbur Wright!

The wider a man's knowledge and outlook, the less will he be inclined to dogmatise, and the converse of this also holds good.

W. SUSSEX.

K. N. HARRIS.

VIRGINIA . . . Continued from page 320

of suitable pattern. The main part of it looks something like a river punt, and no rubbing-plate is needed between the underside and the centre of the truck, as a substitute for it is cast integral, below which is a boss which is turned and screwed to serve as the centre-pin.

Again, if a chucking-piece is cast on the inside of the "punt," opposite to the above-mentioned excrescences, this could be gripped in the three-jaw and the facing, turning, and screwing done at the one setting. Otherwise, the casting would have to be chucked in the four-jaw with the boss for the pin running truly. The assembly and erection of the whole bag of tricks is carried out in the same way as just described for the built-up arrangement.

"Virginia" in other sizes

While this serial has been running I have received some letters asking if the locomotive could be built to half-size to haul a train of old-fashioned wooden cars on a "scenic" line, as a pleasing variation to the usual type of British locomotive used for this purpose. Also some of our American friends want to build a bigger edition to run on a $4\frac{1}{2}$ in. gauge track, and they are asking about the boiler. *Virginia* could easily be adapted to any size within reason, taking the $3\frac{1}{2}$ in. gauge dimensions as a basis,

and varying the details to suit the size of the required engine.

For $1\frac{1}{2}$ in. gauge, the principal dimensions should be halved, as near as possible, but the distance over outside of frames should be $1\frac{7}{16}$ in. and the distance between the backs of the wheels $1\frac{9}{16}$ in. The wheels themselves should be $\frac{1}{4}$ in. wide on the treads, with $3/32$ in. flanges about $3/64$ in. thick.

If sprung coupled axles are desired, underhung spiral springs should be used, one under each axlebox. Cylinders should be $\frac{3}{16}$ in. bore and $\frac{1}{4}$ in. stroke, with loose-eccentric gear set to cut-off at about 60 per cent. A simple displacement lubricator would serve.

The boiler could be of the simple water-tube type, fired by a spirit-lamp or one of my small oil-burners. The outer casing should be half the size of the $3\frac{1}{2}$ in. boiler, made from 20-gauge steel with a lining of $\frac{1}{16}$ in. asbestos millboard around the firebox wrapper. The inside barrel could be made from $1\frac{1}{2}$ in. seamless copper tube, about 22-gauge, not thicker than 20-gauge, with 16-gauge ends and backhead and two $5/32$ in. water-tubes, all joints being silver soldered.

No pump under the boiler would be needed, water being supplied by a hand-pump in the tender. The amount of water in the boiler would last quite a while on a non-stop run

with a normal train, and it could be replenished in a matter of a minute or so while the train stopped at a station. With cylinders of the size mentioned, even fired with a spirit lamp, the baby *Virginia* would have no difficulty in making enough steam to haul quite a big kiddy.

With an oil-burner, it would pull an average adult; a 2-6-0 with similar-size cylinders and wheels, which I built as a present for a friend now, alas! in the land beyond Jordan, hauled my weight around my own little railway for over 20 min. non-stop, and would have kept going indefinitely if the tender had held enough water.

I kept up the level by operating the hand-pump every time she started to blow off at 80 lb. Anybody who wishes to build a half-size American tea-kettle can follow the general construction of any of the similar-size jobs I have described, such as the *Dot* (half-sized *Doris*) and so on.

An enlargement to $4\frac{1}{2}$ in. gauge is a different sort of proposition. While the general dimensions can be increased in the proportion of 4 to 3 certain details like the cross-sections of the motion rods, valve gear, etc., can be made more proportionate to those of a full-size locomotive.

The boiler, too, would need a separate design for this size, as it would be no good just to use the same number of tubes, but of larger diameter, to cite just one variation.

● To be continued.

★ ★ ★ CLUB NEWS ★ ★ ★

Edited by THE CLUBMAN

WHO said that the young lacked initiative? Here, by way of answer, is a story from Kent. Ian Castle, one of the younger members of Welling and District M. and E.E.S., needed the cash to buy a lathe. To get it he took on a job as butcher's boy at week-ends.

And already there is a sequel. At a meeting of the society in January Ian gave a talk on ship models—and produced his first engine for the audience to examine. He had wasted no time for as soon as he acquired his lathe he taught himself how to use it. . . .

It was young men like Ian who gave the model engineering movement its strength in the pioneering days; and it is they in 1957 who will make the future—not only for modelling but for a country which has every intention of remaining Great Britain with full emphasis on the adjective.

STANDING-ROOM ONLY

I have the impression that every model engineering club in Great Britain is seeing "The Titfield Thunderbolt." The film shows of Exeter and District Model Engineers' Society are always very well attended, but the "Thunderbolt" broke all records when it was shown to members and friends at the society's headquarters. Many had to stand throughout the performance. At the end projectionist Williams had the thanks of the chairman—and of the whole audience.

Developments are taking place in the control of the society's "O" gauge railway, and the section is to make additions to the layout—such as harbour and docks—in the near future. It is hoped, possibly in response to a recent advertisement, that the live steamers will soon have the use of a boiler.

This happy society deep in the West Country is looking forward to another enjoyable year. Many suggestions for film shows, visits, talks and other attractive events were made to the committee at the annual meeting, which was described to me as "altogether one of the most pleasant meetings we have had."

The members present—there was a large number—listened with pleasure to the report of treasurer A. T. Reed who also pointed out a slight increase in membership. Secretary L. M. R. Hiscocks in his account of a year's excellent work had much to say

about the remarkable success of the exhibition held in Exeter last August.

All the officers were re-elected, with certain changes. W. J. Hunt became chairman, A. G. Wilkins vice-chairman, and G. Sinclair workshop-track organiser, while L. Tombs jun. joined the committee. Mr Martin had been compelled, by increasing calls on his time, to give up his workshop and track interests.

At the Wednesday evening work-nights, which have been resumed, visitors and new members are welcomed from 7 o'clock onwards. The junior membership is making headway and the society is making a special effort to attract young members. Will young readers who are interested (or old ones, for that matter) write to the secretary at 5, Prince Charles Road, Exeter?

NORTH OF THE BORDER, TOO

"The Titfield Thunderbolt" has also been doing its stuff in Scotland. Accompanied by their presidents, over 60 members of **Edinburgh Society of Model Engineers and Edinburgh and Lothians Miniature Railway Club** enjoyed themselves at Simpson House, Queen Street, Edinburgh, when the society's secretary entertained with this uproarious comedy from Ealing Studios.

Among those who watched the Thunderbolt's adventures were Norman McKillop ("Toram Begg"), retired top-link driver of the famous Pacific locomotive *Spearmint*, and J. Plenderleith, assistant technical curator of the Royal Scottish Museum.

The S.M.E. club rooms and workshop at la Ramsey, Lane, Castlehill, Edinburgh, are open on Tuesdays from 7.30 p.m. and on Saturdays from 3.30. James H. Farr (Wardie Garage, Ferry Road West, Edinburgh 5) asks me to say that all interested are welcome.

TWENTY-FIRST PARTY

Harrow and Wembley S.M.E. had its annual dinner at the Headstone Hotel, Harrow, in January. The dinner was also a coming-of-age party for the society.

Among the 71 members and guests present were Lieut-Commander J. H. Craine (Jason of MODEL ENGINEER), L. H. Sparey and two founder members, Jim Hobson and A. E. Smith. Jason responded to the toast of The Guests.

After president F. Sedcole and chairman C. R. Jeffries had reviewed the club's history Mrs F. Sedcole presented the exhibition trophies. The prize-winning exhibits were on show in the hall.

In 1956 the society held two successful public exhibitions, and members won silver and bronze medals at the Model Engineer Exhibition.

These achievements were reported at the annual meeting held at Heathfield School on the eve of the dinner, with C. R. Jeffries in the chair. More than half of the members attended and a welcome was also accorded to two newcomers. To mark the twenty-first birthday of the society membership was offered without the usual entrance fee. The society hopes, by means of a recruiting drive, to bring its membership to a hundred.

While the finances showed a healthy balance the expenses had increased during the year, and income had risen slightly. It was proposed that to offset rising costs the annual subscription should be raised from 15s. to £1.

M.E. DIARY

February 28.—Hitchin and District M.E.C. annual meeting. South London Ship Model Society talk by J. B. Jenkinson. Hull S.M.E. film show.

March 1.—North London S.M.E. general meeting, Eastern Region Gas Offices, Station Road, New Barnet, 8 p.m. Institution of Mechanics (London section). "New horizons in welding." Courtesy of American Embassy, Pepys House, 8 p.m.

March 6.—Glasgow S.M.E. visit to Colville's steelworks, Cambuslang, 7 p.m. (party limited to 50).

March 7.—Hitchin and District M.E.C. "Some of my Best Photographs," lecture by O. Wilman and the Frost brothers. Eltham and District L.S. "Bits and pieces," Beehive, 8 p.m.



M.E. COMPETITION

BE the Editor of *MODEL ENGINEER* for a day! That is the invitation which is extended to all readers with a competition in which their judgement as Editor will be put to the test. The prize in this simple but intriguing competition is a **MYFORD SUPER SEVEN LATHE**

CONDITIONS OF ENTRY

1. The judges shall decide the order of priority and decide the award of the prize.
2. All coupons will be scrutinised and no claim is necessary. Proof of posting will not be accepted as proof of delivery and no responsibility can be accepted for entries lost, delayed, or damaged, before or after delivery.
3. Closing date for the competition is first post on Friday, 5 April 1957.
4. Employees and the relatives of employees of Percival Marshall & Co. Ltd. and associated companies are not eligible.
5. Any question arising out of, or in connection with, the competition will be decided by the judges and their decision must be accepted as final and conclusive. No correspondence can be entered into.
6. Mutilated or altered entry forms will be disqualified.

Listed below are the headings of the principal contents of *MODEL ENGINEER*. Put them in what you consider is the order of interest and importance to readers by placing the letter against each section in the appropriate column on the coupon. For example, if you think the articles in category E come first, place an E against 1st in number one column and so on.

A panel of judges, balanced in their interests, will be set up by the Editor of *MODEL ENGINEER* and the entrant who submits the coupon which is nearest to the judges' verdict will be awarded the prize. The coupon will be repeated for three weeks and the closing date will be Friday, 5 April 1957. Entry is free and any number of entries may be submitted, but each must be on the printed coupon which must be fully completed.

- A. **Model locomotives.**—Their construction, maintenance and running. Descriptions of models which have been built.
- B. **Railways and locomotives.**—Features on modern locomotives and railway practice in different parts of the world.
- C. **Railways, historical and unique.**—Articles on great locomotives of the past and of lines, systems and practices no longer or little used.
- D. **Model traction engines.**—Constructional series and articles on models which have been built or exhibited.
- E. **Traction engines, prototype.**—Articles on types of machines which are or have been in use; reports of rallies and traction engine events.
- F. **Model steam-engines.**—Articles describing how to build model steam-engines. Descriptions of how they have been built.
- G. **Model power boats.**—Reports of regattas up and down the country and abroad. Operational hints. Descriptions of outstanding craft.
- H. **Workshop practice.**—Advice on difficult procedure in home workshops. Constructional features on how to build accessories and tools.
- J. **Model ships, historical.**—How to build such models as *Myrmidon*; also descriptions of models in museums and exhibitions.
- K. **Model ships, modern and power.**—How to construct models of liners, tugs, etc., and the power plant by which they are driven.
- L. **Working model yachts and full-rigged sailing ships.** Construction and operation. Regattas.
- M. **Clocks.**—How to build clocks and accessories for them. Repairs, etc.
- N. **Internal combustion engines.**—Constructional features of model i.c. engines which can be put to practical use. Descriptions of some of the well known classes and types.
- P. **Photography.**—Articles on making photographic accessories, projectors, optical and scientific instruments, including microscopes. Also hints on photography.
- Q. **Steam-engines.**—Articles on prototype beam engines, mill engines and horizontal engines.

ENTRY FORM—I

1st			
2nd			
3rd			
4th			
5th			
6th			
7th			
8th			
9th			
10th			
11th			
12th			
13th			
14th			
15th			

Send to :
Model Engineer
Competition
19-20 Noel Street
London, W.1.

CLOSING DATE
5 APRIL 1957

BLOCK LETTERS PLEASE:

Name

Address

I agree to the conditions

Signed

A friend who might be interested in becoming a reader of *Model Engineer*:

Name

Address

Model Engineer

Classified Advertisements together with remittance should be sent to Model Engineer, 19/20, Noel Street, London, W.1, by latest Thursday morning prior to date of publication. Advertisements will be accepted from recognised sources by telephone. GERRARD 8811. Ex. 4

CLASSIFIED ADVERTISEMENTS

- ★ Private: 3d. per word. Trade: 6d. per word. Minimum 12 words. Use of box 1s. 0d. extra.
- ★ Rates for displayed advertising in this section, Trade 35s., Staff 45s. per single column inch. (Column width 1½ in.)

The Advertisement Manager reserves the right to refuse or suspend advertisements without giving any reason. Every care is taken to avoid mistakes, but the publishers cannot be held liable in any way for printing errors or omissions. Receipt of "copy" for publication implies acceptance of these conditions by the advertiser. Whilst every care is taken to exclude advertisements from doubtful sources, no responsibility can be accepted by the publishers for the bona fides of advertisers.

WORKSHOP EQUIPMENT

Buck & Ryan for Lathes and Workshop Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661.

Immediate Delivery from Stock, Myford "ML7" and "Super 7" lathes, Super Adept lathes, bench planners, shapers, electric motors, small tools.—F. W. KUBACH, 12, Sylvan Road, London, S.E.19. LIV 3311/12.

Myford Type "M" makers' motorised stand, 4" s/c. chuck, vertical slide, dividing head, steadies, saw table, con. rod fixture, angle plates, etc., £90.—80, Lune Grove, Blackpool.

Lathe Attachment and castings, drill grinding jigs. List 6d.—G. P. Potts, Yew Grove, Troutbeck, Windermere.

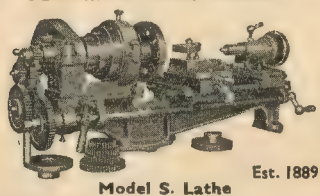
Machine Vice. Set of parts for making small precision vice suitable lathe, miller, shaper, drill, etc. Semi-steel body, hardened jaws, all materials and casting complete in box. Some parts machined, detailed drawings remainder. Price 5s. 9d. each, postage packing extra. Leaflet on request.—LLOYD, Moor Road, Brinsley, Notts.

7½" A.G.H. S.C. Lathe, heavy design, motorised, a.c., hollow mandrel, gap bed by Ryder.—ASTON, 5, Glenny Road, Barking, Essex.

3½" Screwcutting Lathe, vee bed, Dayton, U.S.A., £25. Also ½" cap heavy duty drilling machine, £17. Also portable bench with 1½" shaft a'd pulleys, £10, also 6" to 8" lathe needs attention, buffs and double ended grinders, 2 boxes miscellaneous tools.—257, Shooters Hill Road, Blackheath, S.E.3.

Myford "Super 7" Gearbox, Fobco bench driller, welding plant, ½" scale G.W.R. 4-6-0 near finished exhibition standard. Other models, contents workshop, £300 o.n.o. Would separate, offers invited. Failing sight cause.—BREWSTER, 102, Summer Lane, Birmingham, 19.

CHARLES PORTASS & SON Buttermere Works, Sheffield 8



Model S. Lathe

Wanted. 3½" Drummond or similar, sound, no junk, no fancy prices.—BERRY, 20, Noakes Avenue, Chelmsford.

4" R.B. Drummond on cast-iron-drip tray/stand. Motorised (no motor), counter-shaft, 8 speeds, vee drive headstock, 3-jaw chuck, faceplate/catchplate, changewheels, etc., £16 or reasonable offer.—SUTTON, 1, Tangmere Road, Ifield, Crawley, Sussex.

XL 7" Motorised Bench Shaping Machines, £57 10s. Deposit £10 and 9 payments of £5 16s. or, deposit of £11 10s. and 12 payments of £4 5s. Used lathe list, 1s.—CORBETT'S (LATHES), Stanton Hill, Sutton-in-Ashfield.

Special Offer. Unused "Newman" 1/3 and 1/2 h.p. capacitor start single phase motors, 240/250 volts, sleeve-bearing, foot mounting, 1,425 r.p.m. ½" dia. shaft at £7 each, carriage paid U.K. Cash with orders to—THE ACORN MACHINE TOOL CO. (1936) LTD., 610-614, Chiswick High Road, London, W.4. (Telephone: CHiswick 3416 5 lines.)

Wanted. Taper turning attachment, four tool turret, rear tool post, steadies for Myford ML7 lathe.—Box No. 8431, MODEL ENGINEER Offices, or Phone Southall 4972.

Aerograph or similar spray gun wanted. Reasonable, one needing attention considered.—25, High Street, Llanelli.

3" Portass Lathe B.G., practically brand new, small 4-jaw and Jacobs chucks, £16.—42, King Charles Road, Quinton, Birmingham.

Wanted to purchase, complete Model Shop—Lathe (Myford preferred), Drilling Machine, etc., together with small tools. Only equipment in first class condition considered. Offers in writing to

CL.V. DESIGNS LTD

49, Charles Street, London, W.1

Two Overarm "B" Type Drummond lathes, 1 treadle, 3 chucks, fair condition. £20 or offer.—BAGG, 6 Pavilion Gardens, Staines.

Unrivalled In Its Class. The E.W. 2½" x 10" lathe. Model "A" plain lathe, £15 4s. Fully convertible to back gear and screwcutting. Illustrated leaflet. All accessories from stock. Lists, etc. S.A.E. Credit terms available, let us quote you.—WANSTEAD SUPPLY CO., 30, The Broadway, Woodford Green, Essex.

Mail Order Only. New bargains, post packing 1s. extra under, £1. Vanadium twist drills 17 different ½" to 1½", 13s., 29 ½" to 1½", 48s. Quality 40 t.p.i. ½" dies, 5/32", 7/32", 1", 3s. 4d. each, ½" to 1½", 2s. 8d. Whit. ½", 4s., 3/32", 3s. 4d. B.A. 0-1-2-3-4-5-6, 2s. 8d. each, 7-8, 3s. 4d., 9-10, 4s., 11-12, 6s. 4d. Independent chucks, Burnerd, 3½", 67s. 6d., 4", 72s., 4½", 75s. Hand drills, 1½" chuck, 10s., 16s. Precision drill chucks, ½" 1 M.T., 43s. 6d., 2 M.T., 44s. Taps, 40 t.p.i. 5/32", 1", 7/32", 2s. each, 40 ½", 1s. 3d., Whit. ½", 2s., 3/32", 2s., 5/32", 1s. 3d., ½", 1s. 4d. B.A. 0-1, 1s. 5d., 2-3-4-5, 1s. 4d., 6, 1s. 5d., 7-8, 1s. 8d., 9-10, 2s., 11-12, 3s. 4d. Drill stands 1-60, ½" to 1½", A-Z, 3s. 9d. each. Stillson wrenches 6", 4s. 6d., 8", 6s., 10", 7s. 6d. Hand grinder 6" x 1" wheel, 25s. Breast drills ½" chuck, 27s. 6d. Enclosed gears type, 33s. H.S. centre drills size 1, 2s., 2, 2s. 3d., 3, 2s. 9d., 4, 3s. Dies 1" dia. 40 t.p.i., ½", 3s. 4d. each, 9/32" 32, ½" 32, ¾" 32, 5s. 4d. each, ½" 26, 5s. 4d., ¾" 26, 5s. 4d., 1" 26, 5s. 4d., 40, 9s. 8d., ½" 32, 9s. 8d. Taps 40 t.p.i. ½", 2s. 8d., ¾", 3s., 3s. 4d., 1", 4s., 26 t.p.i. ½", 2s., ¾", 2s. 8d., 32 t.p.i. 9/32", ½", ¾", 2s. 8d. each. Carpenter's ratchet brace, 14s.—S. GRIMSHAW, 7, Hall Street, Manch. 3, ter, 18.

£ **High Speed** sensitive power bench drilling machine, £6 10s. S.A.E. details. Credit terms available.—WANSTEAD SUPPLY CO., 30, The Broadway, Woodford Green, Essex.

Wanted. ML7 or similar. Good bench drill, other good tools. Private. Cash. Will collect London area.—2, Isabella Road, Homerton, London, E.9.

Complete Workshop described in MODEL ENGINEER, 7 July, '55, for disposal. 4½" Britannia s.c. lathe, countershaft and comprehensible equipment: pillar drilling machine 0-1½"; hand-operated shaper; 2 a.c. 23 v. s.p. motors, ½ and 1 h.p. Electric hardening muffle. Surface plate 18 in. x 12 in.; Vernier height gauges, inside and outside micrometers, etc. Host of machine and hand tools, chucks, collets, mandrels, vices, parallels, drills, reamers, etc. Cup-boards and splendid bench, 6 ft. x 2 ft. 6 in. Seen by appointment any time. State requirements by letter to—MIRAMS, 4, Summerfield House, Summerfield, Kidderminster.

Metric Micrometer wanted in new condition.—Box. No. 8433, MODEL ENGINEER OFFICES.

4½" B.G.S.C. Lathe for sale. Chip tray, stand, chucks, face plate, £25.—South, Wall, Church Stretton, Shropshire.

Colchester 6½" B.G.S.C. Gap Bed lathe with power cross feed. Almost perfect condition. Chuck, faceplate, change wheels. No other equipment, £32.—W. MOLDON, 364, King Street, London, W.6.

New Expanding Reamers. Set of two. 17/32" to 19/32", 27/32" to 31/32", 21s. 4d.; one 25/32" to 27/32", 13s. 4d.; one 17/32" to 1 25/32", 32s. plus 1s. 4d. c.o.d.—ADAMS, 6, Alders Road, Edgware, Middlesex.

MODELS AND FITTINGS

Wanted. Donkey pump, single, duplex, or horizontal. Must be in good order. Price and details to—H. RUSSELL, "Latimer," Hooton, Wirral.

Exchange Malar 4½" Lathe, complete, motor, chucks, tools, etc. Brand new, unused (no electric supply). For best offer of 5" or 7½" gauge. (S. Yorkshire).—Box No. 8430, MODEL ENGINEER OFFICES.

KENNION'S CATALOGUES

Tool and Materials 9d.

L.B.S.C. Blueprint & Castings. 1s.
Refunded on first 20/- order

3½" G. Handrail Knobs

3s. 6d. dozen

OVERSEAS ORDERS A SPECIALITY

2 Railway Place, Hertford Phone 2573

Wanted. Radio control unit and marine diesel or electric motor for 36 in. model boat.—43, Easterly Avenue, Leeds, 8.

Wanted. 3½" gauge L.B.S.C. "Juliet" or similar small locomotive. Write giving full details and price wanted to—Box No. 8429, MODEL ENGINEER OFFICES.

Your Models correct to "Their Period" Designs of historic steam engines now available to you. Detailed drawings (and castings). 1" = 1'. Illustrations and leaflets from—PRECISION MODELS CO., Butts Road, Woking, Surrey.

Sale. 5" gauge "Maid of Kent" tender not quite completed. Any reasonable offer accepted.—SEYMOUR, Aston, Nantwich, Cheshire.

Wanted. Driving truck with brakes for 3½" gauge tank locomotive.—DANDRIDGE, 13, Pickhurst Rise, West Wickham, Kent.

Wanted. "OO" Gauge 2-rail d.c. or universal locos, coaches, goods. Half list any make.—52, Panton Street, Cambridge.

Ascot, sink water heater, perfect, complete, £5.—"Ascot," 19, Delafield Road, Charlton, S.E.7.

3½" Britannia. 51 specially selected and shot-blasted castings including cylinders, horns, trailing cradle and fully machined wheels. Cost over £11, accept £8 the lot.—21, High Road, Saltcoats, Ayrshire.

Loco Parts. 2½" "Princess Royal" some work done by toolmaker. Cylinders jig bored, boiler tube materials, templates, drawings, also some "OO" parts and drawings. Cheap lot, £5.—281a, Neasden Lane, London, N.W.10.

ELECTRICAL

A.C. Motors Self Start, induction, 200/250 volts, 50 cycles, 1-phase, 1,425 r.p.m., ½ h.p., £4 2s. 6d. 1/3 h.p., £4 19s. 6d.; ¾ h.p., £6 15s. Perfect and guaranteed. Carriage extra.—JOHNSON ENGINEERING COMPANY, 319, Kennington Road, S.E.11. Reliance 1412/3.

15 Amp Twin Cable, £3 10s. 100 yd. coil. S.A.E. for sample.—TUCKER, 203, Stapleton Road, Bristol.

Electric Blankets. Two solutions either by sewing unit on your own blanket; 75W covers 45 x 39 in., 28s.; 100 W covers 49 x 47 in., 35/-. Or complete electric blanket supplied, 52 x 36 in., 80s., guaranteed, post paid.—EMELLO (LONDON) LTD., 138, Pack Lane, Kempshott, Basingstoke.

Electric Motors. New Hoover ½ h.p., 200/210 v., 1 ph., £5 15s. 400/440 v., 3 ph., £5 5s., carriage paid. Genuine surplus.—LADYBRIDGE WORKS, Hunslet Road, Leeds, 10.

Large New Battery Charger, 200/30 input, 30v./30 amp output, good working order, £45. Also two smaller 6-12 v., 8 amp, s.a.c., £5.—ELSTREE, Denmark Road, Poole.

SITUATIONS

Experienced Model Maker required by West End modelling firm. Good prospects for man with general experience preferably on the metalwork side. Consideration would be given to retired gentleman with suitable experience.—Box No. 8423, MODEL ENGINEER OFFICES.

Draughtsmen, Designers and Tracers (part or whole time) required by sales engineer, to work at home, suit retired people, etc. for marine, hydraulics, engines, aircraft and other projects. Only trustworthy types. State rate required, time available and submit samples of work.—Box No. 8426, MODEL ENGINEER OFFICES.

Boy with Model Engineering Experience required to train as mechanical engineering draughtsman. Apprenticeship offered to suitable applicant by large engineering company in Knightsbridge, London.—Phone KENSington 5151. Mr. S. Wilson.

M.E. Workshop. An opportunity occurs for a skilled craftsman to work in the Model Engineer workshop in London. Ability to develop ideas and experiments in model engineering practice is necessary. The successful applicant would be required to keep careful notes of work done so that they can form the basis for articles in "Model Engineer." Ability to express himself is, therefore, important, though lack of literary style is no impediment. 5-day week. Hours 9.15-5.15. Wages according to age and experience. Please apply in writing to the Editor, MODEL ENGINEER, 19-20, Noel Street, London, W.1.

GENERAL

Spraying Handbook, 3s. 10d. post free. Paints, cellulose, all allied spraying sundries, Catalogue, 2 d.—LEONARD BROOKS, 25, Oak Road, Harold Wood, Romford.

BARGAIN SPOT

High Pressure Flex Metallic Braided ½" bore 1 ft. long with ½" gas nuts, 2/6d. each, post, 7d.

High Pressure Hose, rubber/canvas ½" O/D 7/32" bore, approx. 5 ft. 5 in. long, 1/6d. per length, post 10d. 15/- doz. lengths, post 2/6d.

Tungsten Contact Points, 5/32" dia. x 3/64" thick mounted on 4 B.A. screw threaded ½", 6d. each, post 3d. 5/- doz., post 1/-.

1,000 ITEM LIST FREE

K. R. WHISTON

(Dept. M.E.P.), NEW MILLS, STOCKPORT

Watch and Clock Lathes, cleaning machines, staking tools, etc. (Large illustrated catalogue and price list, 4s. p.p.) Easy payment terms available. Special offer Model 32 "Burner" 3-jaw reversible 2½" chucks with 8 mm. collet adaptors, £4 2s. 10d. p.p.—JOHN MORRIS (CLERKENWELL) LTD., 64, Clerkenwell Road, London, E.C.1.

Model Engineer

SUBSCRIPTION FORM

Overseas readers may experience difficulty in obtaining Model Engineer. To become an annual subscriber send an International Money Order for 58s. 6d. sterling (\$8.50 in U.S.A. and Canada) with the completed form below.

Please send a copy of Model Engineer each week to:

Name
(Block letters please)

Address
.....
.....

enclose valued 58s. 6d. (\$8.50) to cover subscription for one year (52 issues). This includes postage.

Post this form to

MODEL ENGINEER • 19-20 NOEL ST • LONDON W1

Build Your Own Refrigerator. All components available at reasonable prices. Frigidaire units, £5. Single cylinder units, £4. New G.E.C. Coldair hermetically sealed and absorption units in stock. Hire purchase available. Heavy duty motors, 1/6th h.p., £2 10s. New chrome cabinet handle and hinges, £1 set. Money back guarantee. S.A.E. for list and schematic diagram.—WHEELHOUSE, 11/13, Bell Road, Hounslow. Phone: Hounslow 8749.

Compressors for Sale. Two pistons complete with air receiver, driving wheel and motor cradle. 180 lb., 2½ cu. ft., price £3. Motors a.c. and d.c. all types ½ h.p., £3. Carriage forward.—WHEELHOUSE, 13, Bell Road, Hounslow. Phone: Hounslow 8749.

Air Compressors, tanks and accessories at far below list, from £5 17s. 6d., TV and lighting generator from £15.—TEDDINGTON ENGINEERING CO. LTD., 29-31, High Street, Teddington, Middx. Tel: Kingston 1193.

Aqualung and Compressor equipment, ballraces and miscellaneous items. Lists 2d.—PRYCE, 157, Malden Road, Cheam.

Learn It As You Do It—we provide practical equipment combined with instruction in radio, television, electricity, mechanics, chemistry, photography, etc. Write for full details to—E.M.I. INSTITUTES, Dept. ME47, London, W.4.

Highly Satisfied Customers repeat orders, surplus unused taps, dies, majority B.A. various numbers, sizes, send 10s. packet 24, postage paid anywhere, mail order only, ridiculously cheap.—FLOWERS, 52, Airedale Avenue, W.4.

Brand New Extending Ladders, for tools, drills, electrical equipment, sanders, grinders or anything useful, no junk.—HOWELL, Clifton, Rogerstone, Mon.

DON'T LET RUST WORRY YOU!

**OXYNIL SPRAY
KEEPS RUST AT BAY!
TOOLS ALWAYS READY FOR INSTANT USE**

½ pint Tin and Spray 10s. 6d. post free
Sole Agent: **H. GIBSON, Church Lane,
Gt. Hallingbury, Bps. Stortford, Herts**

Precision Engineers. Want ideas, patents bought.—Box No. 8399, MODEL ENGINEER Offices.

New Ball Races, Hoffman, S.K.F., etc., 24 mm. O.D., 9 mm. bore, 10s. doz., post free, special price for quantities. Sample pair, 2s. 3d.—MATHEWS, 165, M.E. Queens Road, Peckham, S.E.15.

Plastics Fabricated to Order. Singles or quantity. We supply fibreglass and resins, Perspex, P.V.C., Tufinol. S.A.E.—PLASTIC SERVICES LTD., 16, Gloucester Road, Brighton.

For Guaranteed Watch Repairs, also all replacement parts, try—YOUNG & SON, 133, London Road, Chippenham, Wilts.

Wanted. Bound Volumes of "Model Engineer" up to 1933. Also bound volumes of "English Mechanics," any year. Must be in good condition. Reasonable price.—Box No. 8419, MODEL ENGINEER Offices.

Carborundum Grinding Stones, three new 16 in. dia., £10 to clear the lot.—OLDHAM, Trechaven, Upton Park, Chester.

Water-line Model Kits (unpainted), complete 10s.—CAMAS, 10, Mark Street, Wallasey.

"M.E.s" Vol 106-113 complete, £3, or 9s. vol.—MAXEY, Moulsoe, Newport Pagnell, Bucks.

M.E.'s 1940-1949, £1 per volume.—ARMYTAGE, Hillboro, Sandgate, Folkestone.

Cabinet 13" x 9" x 6½" comprising 18 mahogany drawers, 35s. Suitable any small articles. Particulars.—341a Stanstead Road, London, S.E.6.

Wanted, old coach and carriage lamps.—Box No. 8428, MODEL ENGINEER Offices.

Lister Industrial Diesel Engine, 8½ h.p., complete with 2-1 reduction gear. New condition, cost £280, will accept £125 o.n.o.—BREEZCRETE, 499, High Road, Ilford. ILF 1734.

Plastic Injection Moulding Machines. Hand operated bench injection machines for laboratory and experimental purposes or for handicrafts and hobbies. Moulds made to order. Write or phone.—DOHM LTD., 167, Victoria Street, London, S.W.1. Victoria 1414 (8 lines).

"M.E.'s" 1953-54, 55-56, unbound, 10s. vol.—EVANS, 241, Old Ford Road, E.3.

Steam Live Castings at reduced prices to clear, also taps and dies, copper tubes, etc. Send for complete list including bargain sales of "O" and "OO" model railways, price 6d. from—ATTENBOROUGH MODEL RAILWAY, 82, Arkwright Street, Nottingham.

Motors and Fans, 1½" dia., 3¼" long, four bladed fan, 5" dia., 6 volt, 2 amps, 1,500 r.p.m., 12 volt, 3 amp, 2,500 r.p.m. d.c. only, new, 15s. 6d. p.p. Ideal for use with car heater or ventilation, etc. List of over 300 ex-W.D. lines. S.A.E.—G. BRIGGS, 66, Fylde Road, Preston.

Compound Cylinder Block, 7" x 3" x 3", 1½ h.p., 1¼" l.p., 2" stroke, crossheads, slide bars, crankshaft bearings, £6. Double cylinder horizontal steam engine, beautifully made phosphor-bronze cylinders, 1½" x 3" Stephenson link reversing, flywheel 10½" x 2", weight approx. 1 cwt., £15. Copper locomotive type boiler weight 30 lb., slight fault, £6.—IRVING, Rawcroft, Penrith.

WE SPECIALISE

IN EVERYTHING FOR THE MODEL ENGINEER

Myford, Zyto, EW Lathes from stock
Plans, materials, tools, electric motors, etc.

"Caley" universal cutting oil 2/-. Post 1/-.

"Caley" super steam oil 2/-. Post 1/-.

"Caley" steam packing ⅛ rnd. 1½d. foot.
⅛ rnd. 3d. ⅛ square 7d. foot.

PATTERNMAKING
NO CATALOGUE MEANTIME

CASTING

MACHINING
S.A.E. ENQUIRIES



CALEDONIA MODEL CO.
5 PITT STREET GLASGOW C2

Corner of 468 Argyle Street

"No Quantity Too Small"

**BRASS, COPPER, BRONZE,
ALUMINIUM, LIGHT ALLOYS**

IN

Rod, Bar, Sheet, Tube, Strip, Wire,
Angle, Channel, Tee.

H. ROLLET & CO. LTD.

6, Chesham Place, London, S.W.1
SLOane 3463

Works:

32-36, Rosebery Avenue, London, E.C.1

BRANCHES AT

Liverpool

Manchester

Birmingham

Leeds



**7,000
EX-ADMIRALTY
STOP WATCHES**

**55' each
POST FREE**

By renowned Swiss Makers. High grade jewelled movement. Reads to 1/5th second and records to 30 minutes. Start and stop with slide; fly back by winding button. Fully guaranteed. Would cost today more than £7.

CHARLES FRANK

67-73 SALTMARKET, GLASGOW, C.1

'Phone Bell 2106/7.

Established 1907

Britain's largest stockists of ex-Government binoculars and scientific equipment. Send for free catalogue.

CROSS SLIDE HEAD FOR ML7 AND SUPER 7

A heavy duty attachment to avoid overhead drives. Drilling, milling, dividing, key-seating without disturbing parts previously turned in chucks or on faceplates. Used with standard vertical slides for gearcutting.

**DESIGNED BY L. H. SPAREY
DESCRIBED IN M.E. MAY 1956**

£4.5.0

Post Free

By post only from:—

TURRET COMPONENTS
10, Hervey Pk. Rd., Walthamstow,
London, E.17

TELEPHONE UNITS SOUND POWERED NO BATTERIES REQUIRED

Just connect with twin flex for 2-way conversion, 9/- per pair. Twin flex 4½ yd., post 1/6. One pair each end will avoid changing over from mouth to ear, 18/-. Two pairs, each complete with cord, plug, and socket, 27/6.

HANDSETS, G.P.O. type, but sound powered, complete with cord, plug and socket, 50/- per pair, post 2/6. The ideal job for home or office, just connect with flex.

BELL SETS, G.P.O. type 25. Available at 17/6 each. **RINGING GENERATORS** for same, 10/6, post 2/-.

BATTERY CHARGERS. Output up to 22 volt, 10 amps., controlled by two four-position rotary switches for fine and coarse control. Input 200/250 volt, a.c., 50-cy., fused for a.c. and d.c., clear scaled ammeter. Brand new, made by S.T.C. £17 10s. 0d., cge. 15/-.

CHARTBOARDS. With pantograph arm, perspex scale, protractor head as used in the R.A.F. for navigation purposes, 17 in. square. Brand new, will make a useful drawing board, 25/-, post 3/-.

HEADPHONES. Sensitive balanced armature type DHR, 17/6 per pair, post 1/6.

VACUUM PUMPS or Rotary Blowers. Ex R.A.F. brand new, 7 cu. ft. per min. 10 lb. per sq. in. at 1,200 r.p.m. 22/6 each, post 2/9.

VOLTMETERS. 2" 0/20, 0/40, 0/300 D.C., 10/6. 2½" 0/15, A.C., 15/6. 0/300 A.C., 25/-, 5" 0/300 A.C., 60/-, post 1/6.

AMMETERS. 0/25 2½" D.C., 7/6; 2" 50-0-50 D.C., 12/6; 2½" 0/20 A.C., 25/-; 5" 0/50 A.C., 60/-, post 1/6.

ROTARY CONVERTERS. Input 24 volt D.C. Output 230 volt A.C., 50 cy., 100 watt, 92/6, also available in a metal case with switch, 105/-, cge. 7/6.

CHARGING RECTIFIERS. Full Wave Bridge 12 volts 2 amps, 13/6, 4 amps, 22/6, suitable transformers 2 amp, 24/-, 4 amp, 27/3, post 2/-.

VENTAXIA FANS. Extraction or intake. Brand new 12 volt D.C. Blades 6 in. diam., silent running, 90/-, 230/250 volt type for A.C. mains, 130/-, post 3/-.

A.C. MOTORS. 1/3rd h.p., 1,425 r.p.m., ½" shaft, ball bearings, foot mounting, 220/230 volts single phase. Brand new, £6/10/0, cge. 7/6.

GEARED MOTORS for the model-maker. Small but powerful, 12/24 volts, D.C., 4/8 r.p.m., 35/-, post 2/6.

MOTOR 12 volt, D.C. 1½" x 2" approx. 3,000 r.p.m. with speed regulator in end cap. A precision job. 12/6, post 1/6.

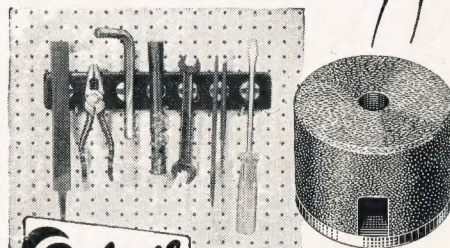
VARIABLE RESISTANCE. 160 ohms, 2 amps, on 10½" Twin formers, gearing with control handle. Suitable for dimming, 35/-, post 2/9.

WILCO ELECTRONICS (DEPT. M.E.)
204, LOWER ADDISCOMBE ROAD, CROYDON

Permanent Magnets in action

*The finest tool-rack
you ever saw. . .*

Make your own magnetic tool rack and keep your workshop tidy! This and many other uses of "Eclipse" magnets are shown in descriptive leaflets, available through your usual tool dealer.



**PERMANENT
MAGNETS**

Made by James Neill & Company, (Sheffield) Limited
and obtainable from all tool distributors

PM-43

Back Numbers of "Home Mechanics"

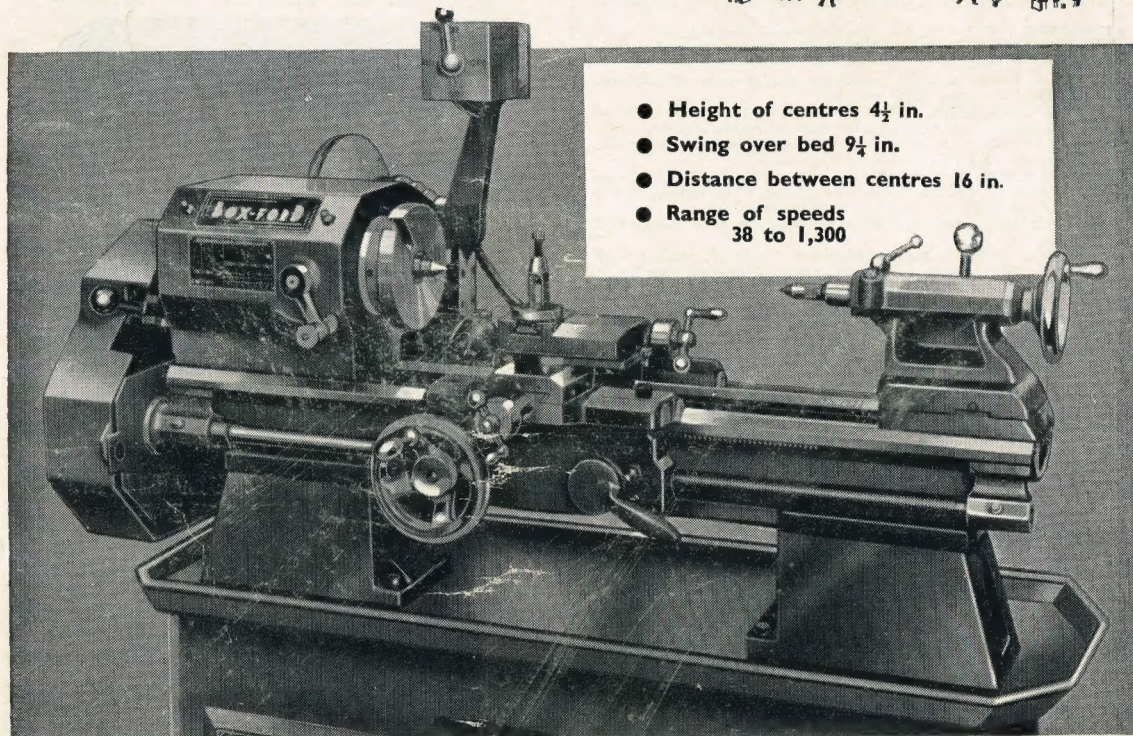
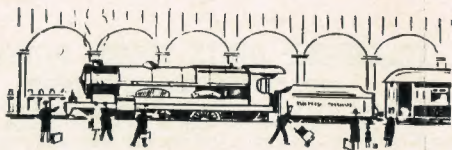
Since it was first introduced in July of last year, *Home Mechanics* has published numerous articles on how to make useful things for the home. Back numbers of relevant issues—July 1956-February 1957—are obtainable post free.

Month	Month	Month	Month
Airing cupboard .. Sept.	Contemporary bookcase .. Jan.	Kitchen drier .. Feb.	Servicing vacuum cleaners .. Oct.
Barometer .. July	Copper bucket .. July	Kitchen stool .. Sept.	Sewing cabinet .. Dec.
Bathroom cabinet .. Oct.	Crystal set .. Jan.	Lampshades .. Sept.	Simple wrought iron .. Jan.
Bathroom stool .. Jan.	Desk lamp .. Dec.	Lino repairs .. Feb.	Standard lamp .. Jan.
Battery charger .. Nov.	Desk top repair .. Feb.	Loft ladder .. Sept.	Steel work bench .. Nov.
Bed table .. Feb.	Developing dish .. Sept.	Lock-joint attachment .. Feb.	Stepped table .. Nov.
Bedside Bookshelf .. Aug.	Doorbell chimes .. Sept.	Loudspeaker cabinet .. Nov.	Stepping stone path .. Jan.
Bedside cabinet .. Nov.	Electric food mixer .. Sept.	Marquetry pictures .. July, Aug.	Table bookcase .. Feb.
Bellows .. Feb.	Extending ladder .. Nov.	Motorised lawn mower .. July	Table lamp .. Dec.
Bench top holding device .. July	Flush doors and pelmets .. Sept.	Motorised sewing machine .. Nov.	Table lighter .. Oct.
Bevelled table top .. Dec.	Folding table .. Dec.	Multiplication game .. Dec.	Tap reseating cutter .. Oct.
Book rack .. Feb.	Fountain pen repairs .. Dec.	Music box .. Aug.	Tea tray, bed table .. Dec.
Brick paths .. Feb.	French polishing .. Nov.	Occasional table .. Sept.	Tea wagon .. July
Candlesticks .. Nov.	Garden roller .. Aug.	Ornamental firescreen .. Feb.	Tea wagon (marquetry) .. Oct.
Car heater .. Jan.	Garden swing .. July	Ornamental walls .. Dec.	Tinted garden path .. Oct.
Car luggage trailer .. Oct.	Gas blowpipe .. Dec.	Photo frame .. July	Toys .. Jan.
Car picnic table .. Sept.	Glove puppets .. Dec.	Photo lampstand .. Feb.	TV improvement .. Jan.
Chair repairs .. Feb.	Hair drier .. July	Picnic chair .. Aug.	Upside-down shelf .. Dec.
Christmas decoration .. Dec.	Hall lantern .. Oct.	Plant holders .. Oct.	Wall desk .. Dec.
Clothes airer .. Jan.	House and garden tips .. Dec.	Plant pot holder .. Nov.	Wall desk .. Jan.
Clothes drier .. Dec.	House nameplate .. July	Playpen/cot .. Jan.	Wall lights .. Dec.
Clothes post .. Sept.	Household steps .. July	Poker .. July	Wallpaper estimating .. Nov.
Coal bin .. Sept.	Inserting fence posts .. Sept.	Portable cupboard .. Nov.	Wheelbarrow .. Sept.
Coal scuttle .. Oct.	Iron gate stops .. Oct.	Powder bowl .. Sept.	Whisky cask .. Aug.
Coffee table .. Aug.	ITV aerial .. Feb.	Refrigerator .. Aug.	Window box .. Feb.
Competition .. Dec.	Kitchen chair upholstery .. Oct.	Rose arbor .. Nov.	Wrought iron gates .. Aug.
Contemporary armchair .. Oct.	Kitchen dining table .. Nov.	Sawing stool .. Nov.	Wrought iron table .. July

Send P.O. for 1s. 3d. for issue required to:

Back Number Dept., "Home Mechanics", 19-20, Noel Street, W.1

THE "MODEL" LATHE



- Height of centres $4\frac{1}{2}$ in.
- Swing over bed $9\frac{1}{4}$ in.
- Distance between centres 16 in.
- Range of speeds
38 to 1,300



... FOR MODEL MAKING

The Boxford Lathe bed with three Vees ensuring accurate location of the Head, Saddle and Tailstock enables Model Engineers to reproduce with the utmost accuracy the intricate parts of Model Railways, Aircraft, Steam Engines, etc.

The Model C.S.B. is supplied complete with $\frac{1}{3}$ h.p. motor and starter, ready for immediate use.

Boxford

MODEL C.S.B.

$4\frac{1}{2}$ CENTRE LATHE

PRICE

£105

Send for fully detailed leaflet TODAY!

DENFORDS ENGINEERING CO. LTD • HECKMONDWIKE • YORKSHIRE